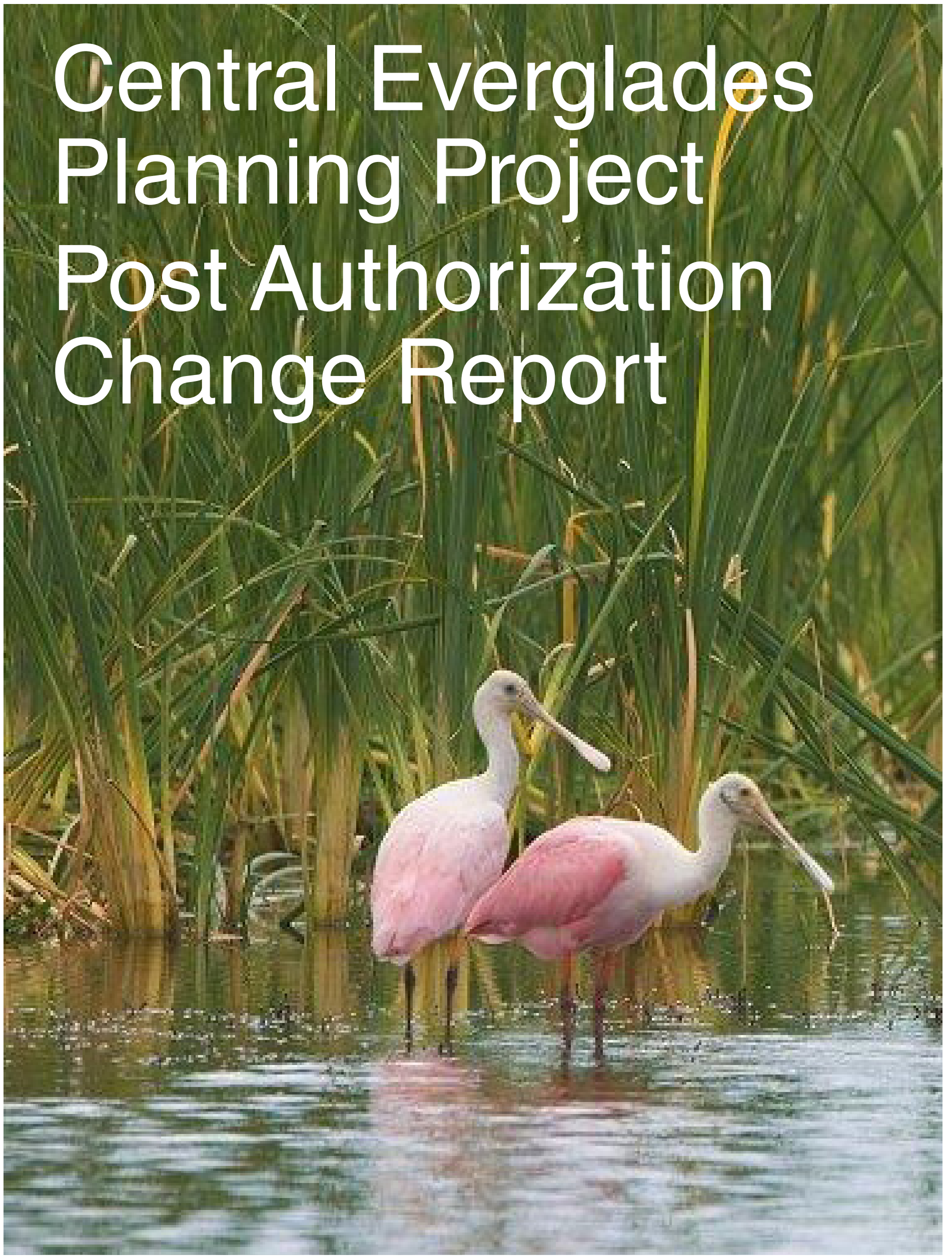
Central Everglades Planning Project Post Authorization Change Report



Feasibility Study and Draft Environmental Impact Statement

March 2018

INTEGRATED FEASIBILITY STUDY AND
DRAFT ENVIRONMENTAL IMPACT STATEMENT
(POST AUTHORIZATION CHANGE REPORT)

Central Everglades Planning Project
St. Lucie, Martin, Okeechobee, Glades, Hendry, Palm Beach, Broward, Miami-Dade, Monroe, Collier, Lee and Charlotte Counties, FL

Lead Agency: Department of Army
U.S. Army Corps of Engineers (USACE)

Abstract:
The South Florida Water Management District (SFWMD), as local sponsor for the authorized Central Everglades Planning Project (CEPP) plan, has prepared this Post Authorization Change Report (PACR) Integrated Feasibility Study and Draft Environmental Impact Statement (FS/DEIS) for a tentatively selected plan (TSP) to increase the amount of water storage and treatment in the currently authorized CEPP plan. CEPP was authorized by Congress in the 2016 Water Infrastructure Improvements for the Nation Act, which includes the Water Resources Development Act (WRDA) of 2016 as Title I. This CEPP PACR has been prepared by the SFWMD under the authority provided by Section 203 of WRDA 1986, as amended and in accordance with USACE regulations and guidance. Section 203 provides that a non-Federal interest can submit a completed feasibility study to the Assistant Secretary of the Army for Civil Works for review to determine if the study, and the process under which it was developed, comply with Federal laws and regulations applicable to feasibility studies of water resources development projects.

The proposed modification to the CEPP Plan addressed in this CEPP PACR is construction of a 240,000 acre-feet (ac-ft) reservoir (A-2 reservoir) with multi-purpose operational flexibility, a 6,500-acre stormwater treatment area (STA), and conveyance improvements in lieu of the currently authorized A-2 Flow Equalization Basin (with a capacity of approximately 56,000 ac-ft). The TSP would further reduce the number, return frequency and severity of undesirable, damaging, high-volume discharges from Lake Okeechobee, improving salinity and water quality conditions in the St. Lucie and Caloosahatchee Estuaries. In combination with previously authorized projects, the PACR TSP would move closer to the CERP goal of approximately 80% reduction in damaging discharges to the Northern Estuaries, by providing a 55% reduction in discharge volumes and a 63% reduction in mean monthly high-flow discharge events to the Northern Estuaries from Lake Okeechobee. In addition to reducing damaging discharges to the Northern Estuaries, the TSP would substantially increase CEPP flows to the central Everglades from an average annual flow of approximately 210,000 ac-ft to an average annual flow of approximately 370,000 ac-ft.

The estimated first cost of the currently authorized CEPP plan (2018 price level) is $2,031,000,000. The estimated first cost of CEPP, as modified by the PACR TSP, would be $3,174,000,000.

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EXECUTIVE SUMMARY

The South Florida Water Management District (SFWMD), as local sponsor for the authorized Central Everglades Planning Project (CEPP) plan, has prepared this Post Authorization Change Report (PACR) Integrated Feasibility Study and Draft Environmental Impact Statement (FS/DEIS) to increase the amount of water storage and treatment in the authorized CEPP that will be the project features of the future Project Partnership Agreement (PPA) for New Water and improved conveyance in the North New River and Miami canals. Releases from Lake Okeechobee through the C-43 and C-44 canals to the Northern Estuaries, as regulated by the U.S. Army Corps of Engineers (USACE), result in damaging effects to the ecosystem. The increase in storage and treatment provided by the proposed changes addressed in this PACR would further reduce these damaging discharges and send additional water south to the Everglades. The proposed modifications contained in this PACR would provide an overall 55% reduction in discharge volumes and a 63% reduction in the number of discharge events to the Northern Estuaries from Lake Okeechobee, when analyzed in conjunction with other authorized projects. High-flow discharges lasting more than 60 days in the Caloosahatchee River Estuary or more than 42 days in the St. Lucie Estuary have been found to be particularly damaging to the oyster populations which are an indicator of the health of the estuary. The additional storage and treatment proposed in the PACR would reduce the number of these discharges by an additional 40% in the Caloosahatchee Estuary and 55% in the St. Lucie Estuary, in addition to the benefits provided by CEPP. The reduction in discharges improves the salinity conditions in the estuaries by reducing the number of events that exceed the preferred salinity envelope above CEPP by 39% in the St. Lucie Estuary and by 45% in the Caloosahatchee Estuary.

The CEPP was authorized by Congress in the 2016 Water Infrastructure Improvements for the Nation (WIIN) Act, which includes the Water Resources Development Act (WRDA) of 2016 as Title I. The CEPP provides the first increment of restoration of the central Everglades by reducing some of the damaging discharges to the Northern Estuaries and providing an average of approximately 210,000 acre-feet (ac-ft) per year of additional flow into the central portion of the Everglades. The Final CEPP integrated project implementation report (PIR) and environmental impact statement (EIS) evaluated the Federal interest in implementing the CEPP, a component of the Comprehensive Everglades Restoration Plan (CERP), which was approved as a framework for restoring the south Florida ecosystem while providing for other water-related needs of the region in the WRDA 2000. The Final CEPP PIR/EIS presented a description of existing and expected future conditions in the south Florida ecosystem, formulation, and evaluation of plans considered to address ecosystem restoration needs in the region, analysis of environmental effects of the recommended plan, project costs, and implementation challenges.

In addition to reducing damaging discharges to the Northern Estuaries, the CEPP PACR Tentatively Selected Plan (TSP) would increase CEPP flows to the central portion of the Everglades from an average annual of approximately 210,000 ac-ft to an average annual of approximately 370,000 ac-ft. This additional freshwater flow to the central Everglades is essential to Everglades Restoration, helps to achieve the CERP goal, and will be protected for the natural system. The PACR reaffirms that the authorized CEPP project features that will be the subject of the other two future CEPP PPAs, namely CEPP PPA North and CEPP PPA South, can accommodate these additional flows sent south to the central Everglades that would result from additional canal conveyance, storage, and treatment wetlands proposed on lands within the Everglades Agricultural Area (EAA). These additional flows are delivered with a timing shift that favor dry season flows in addition to CEPP when downstream infrastructure has adequate capacity to convey the flow. CEPP envisions that three separate PPAs will be executed to implement the project; namely, CEPP PPA New Water, CEPP PPA North, and CEPP PPA South, as further described on page ES-14.

PURPOSE AND NEED

The purpose of the CEPP PACR is to further improve the quantity, quality, timing, and distribution of water flows from Lake Okeechobee to the St. Lucie and Caloosahatchee Estuaries (Northern Estuaries), the Greater Everglades (Water Conservation Area 3 [WCA 3], and Everglades National Park [ENP]), and Florida Bay while maintaining flood control and water supply for existing legal users.

Since the approval of CERP in 2000, several projects have been Federally authorized and/or funded for construction. Authorized projects relevant to this CEPP PACR include Indian River Lagoon-South, Caloosahatchee River (C-43) West Basin Storage Reservoir, C-111 Spreader Canal Western, C-111 South Dade, Modified Water Deliveries to ENP, Biscayne Bay Coastal Wetlands Phase I, Site 1 Phase I, Broward County Water Preserve Areas, Herbert Hoover Dike Rehabilitation, and Tamiami Trail Next Steps. Construction of the A-1 Flow Equalization Basin (FEB) was completed by the SFWMD in 2015 as part of the State of Florida’s Restoration Strategies Program and is fully operational. The SFWMD is expediting construction of two CEPP PPA South features—increasing the S-333 structure capacity and removal of Old Tamiami Trail under Pre-Partnership Credit Agreements with the USACE. The State of Florida has also voluntarily provided funding and in-kind work to implement the Florida Bay upper Taylor Slough project; improve C-111 South Dade operations; advance completion of the Tamiami Trail Next Steps bridging; and expedite completion of the Herbert Hoover Dike Rehabilitation. These expedited efforts, coupled with progress made on the State of Florida’s Restoration Strategies Program, will allow for near-term improvements in system-wide operational flexibility and promote additional freshwater flow to ENP and Florida Bay.

Despite the restoration progress that will result from implementation of the authorized CEPP plan, ecological conditions and functions within the Northern Estuaries and central portion of the Everglades ridge and slough community require additional infrastructure to achieve CERP restoration goals and objectives. Without additional water storage and treatment, such as those identified in the PACR and other CERP and non-CERP projects, ecological conditions and functions in estuaries on the east and west coasts of Florida will continue to experience adverse impacts due to excessive damaging regulatory releases from Lake Okeechobee during wet years, while the Greater Everglades requires additional flow with the proper timing and distribution to improve ecological conditions (**Figure ES-1**).

The goal of the CEPP PACR is to develop a plan to provide sufficient conveyance, water storage, and treatment capacity south of Lake Okeechobee in the EAA to further reduce damaging discharges to the Northern Estuaries and deliver additional flow to the Greater Everglades consistent with the CERP goals.

The Northern Estuaries were subject to excessively damaging regulatory releases in 2016 and 2017 resulting in successive years of environmental and economic impacts to these regions. To respond to these concerns, the Florida Legislature, through Florida State Law Chapter 2017-10, directed the SFWMD to advance planning for the Everglades Agricultural Area Reservoir component and develop a CEPP PACR for additional storage and treatment south of Lake Okeechobee consistent with the CERP. Plan formulation under this PACR evaluates alternatives for the final increment of the CERP EAA Storage Reservoir (Component G) needed to further reduce damaging discharges to the Northern Estuaries and achieve the CERP goal of sending water south to the central portion of the Greater Everglades. The CEPP PACR builds upon the first increment of CEPP by providing additional water storage, treatment, and conveyance south of Lake Okeechobee to further reduce the volume, duration, and frequency of damaging regulatory discharges from Lake Okeechobee to the Northern Estuaries by redirecting flow south to the central portion of the Greater Everglades.

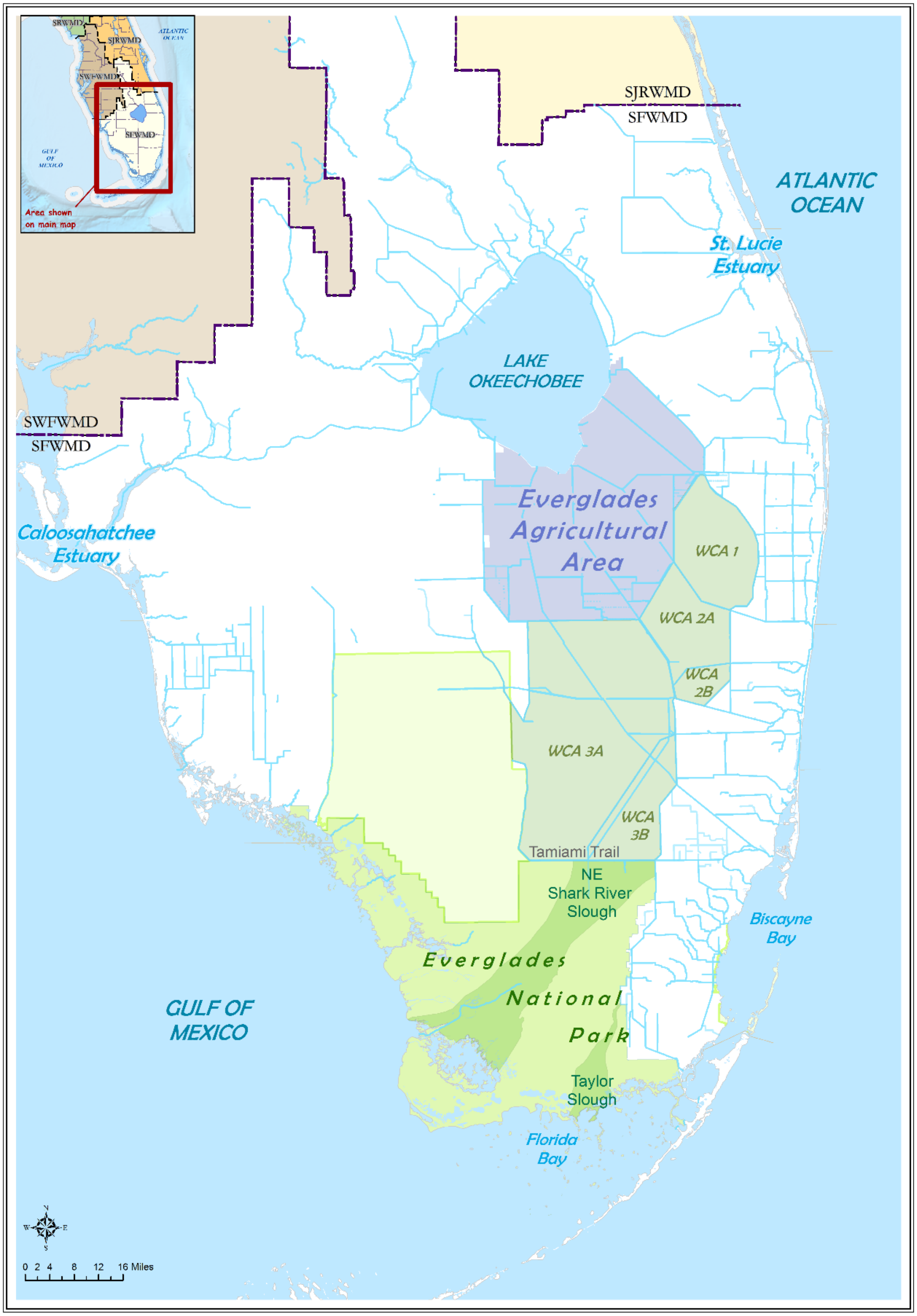

Figure ES-1. Map of Study Area

AUTHORITY

This CEPP PACR has been prepared by the SFWMD under the authority provided by Section 203 of the WRDA of 1986, as amended, and in accordance with relevant U.S. Army Corps of Engineers (USACE) regulations and guidance. After approval by the Governing Board of the SFWMD, the CEPP PACR was submitted to the Assistant Secretary of the Army for Civil Works in March of 2018. Section 203 provides that a non-Federal interest can submit a completed feasibility study to the Assistant Secretary of the Army for Civil Works for review to determine if the study, and the process under which the study was developed, each comply with Federal laws and regulations applicable to feasibility studies of water resources development projects. Section 203 provides that within 180 days of receipt of the non-Federal feasibility study, the Secretary shall submit to the Committee on Environment and Public Works of the Senate and the Committee on Transportation and Infrastructure of the House of Representatives a report that includes the results of the Secretary's review of whether the feasibility study and the process under which the study was developed, comply with Federal law and regulations; a determination of whether the project is feasible; any recommendations concerning the plan or design of the project; and any conditions that the Secretary may require for construction of the project.

The USACE has provided technical assistance in the preparation of this CEPP PACR, as directed by the Assistant Secretary of the Army for Civil Works (Fisher 2018). The Assistant Secretary considers this study unique and distinguishable for USACE technical assistance. This study has a goal of identifying a tentatively selected plan, confirming the Federal interest, and preparing the recommendation to Congress by October 1, 2018.

ALTERNATIVE PLANS AND THE TENTATIVELY SELECTED PLAN

Planning goals for CERP projects include enhancing ecological and economic values and social well-being. These three goals were considered during the formulation of the CEPP PACR alternative plans, and project-specific objectives and constraints were established to evaluate the plans. In general, ecosystem restoration objectives focused on capturing damaging freshwater discharges from Lake Okeechobee that historically have been sent to the St. Lucie and Caloosahatchee Estuaries and providing additional water to the central Everglades. In this PACR, the quantity, timing, and distribution of flows to the Northern Estuaries and the quantity, quality, timing, and distribution of flows to the Greater Everglades were evaluated; maintaining existing levels of flood control service and water supply for municipal, agricultural, and Tribal use were also evaluated.

The plan formulation strategy for CEPP PACR consisted of a formulation phase that followed the natural, pre-drainage, southerly flow of water from Lake Okeechobee through the Everglades ecosystem to Florida Bay. The strategy involves the formulation of canal conveyance, above-ground storage, and treatment wetlands that serve to reduce damaging discharges to the Northern Estuaries and restore the central portions of the Everglades by utilizing the CEPP PPA North and PPA South project features to improve flow to WCA 3A, WCA 3B, ENP, and Florida Bay consistent with both the CEPP and CERP. The plan formulation framework considered conveyance, above-ground storage, and wetland treatment measures within the EAA consistent with the CERP and CEPP, to capture, store, and deliver water south to the Greater Everglades. The CEPP PPA North and PPA South project components for redistributing water within WCA 3A creating additional hydrologic connectivity between WCA 3A, WCA 3B, and ENP, and effectively managing seepage along the eastern boundary of the Everglades, were re-evaluated and determined to be robust enough in the CEPP design to accommodate the additional timing shifts and flow volumes delivered by this CEPP PACR.

The CEPP PACR study evaluates alternatives and identifies a tentatively selected plan (TSP) for the final increments of four components of the CERP:

- Everglades Agricultural Storage Reservoirs (Component G)
- Flow to Northwest and Central WCA 3A (Component II)
- Environmental Water Supply Deliveries to the St. Lucie Estuary (Component C)
- Environmental Water Supply Deliveries to the Caloosahatchee Estuary (Component E)

The CEPP PACR study also includes updated System-wide Operational Changes – Everglades Rain-Driven Operations (Component H).

Management measures were compiled from previous EAA Reservoir Phase I of CERP and more recently CEPP. Planning efforts and new measures were identified for the CEPP PACR consistent with study objectives. These measures were screened during preparation of the CEPP PACR consistent with the study objectives and criteria previously established specifically for CEPP. An array of distinct management measures including conveyance, above-ground storage, and wetland treatment measures were identified with multiple size and configuration potentials for each measure.

To facilitate the evaluation of combinations of management measures, screening criteria were developed to select the array of canal conveyance, above-ground storage and wetland treatment management measures, and plans for detailed modeling and evaluation. Five alternative configurations (**Figure ES-2**) and the no-action plan were evaluated using three hydrologic simulation model outputs, including an alternative for multi-purpose (environmental restoration and other related needs, as described in component G of the CERP) use of the storage reservoir. Performance measures were used to evaluate the degree to which proposed alternative plans met CERP goals and restoration targets. Planning-level cost estimates were developed for the five alternative plans, ecosystem restoration benefits were calculated, environmental impacts were considered, and compliance with pertinent Federal and state laws and regulation and USACE planning guidance were applied to the formulation and evaluation of alternative plans and selection of the TSP.

The overall intent for formulating the CEPP PACR alternative plans is to reduce high-volume freshwater discharges from Lake Okeechobee, as managed and operated by USACE, that are currently contributing to undesirable damaging ecological conditions in the Northern Estuaries (St. Lucie and Caloosahatchee) causing environmental and economic losses, and redirect water southward to the central portion of the Greater Everglades, consistent with the goals and restoration targets identified in the CERP. These environmentally beneficial flows south from Lake Okeechobee would improve estuary conditions, improve the economy, and restore a more natural mosaic of habitat conditions in WCA 3, ENP, and Florida Bay.

To quantify the potential water available, a Future Without (FWO) project condition baseline scenario was evaluated with the CEPP PACR hydrologic modeling tools to identify water discharged from Lake Okeechobee in excess of defined target flows for the Northern Estuaries. Over 500,000 ac-ft of excess water is discharged to the Northern Estuaries on an average annual basis under the Lake Okeechobee Regulation Schedule (LORS). The CEPP PACR plan formulation activities developed scenarios to redirect this excess water, subject to the project objectives and constraints, and evaluated the number of high flow events to the Northern Estuaries that can be eliminated by implementing conveyance improvements, a storage reservoir and water quality treatment facilities for flows south.

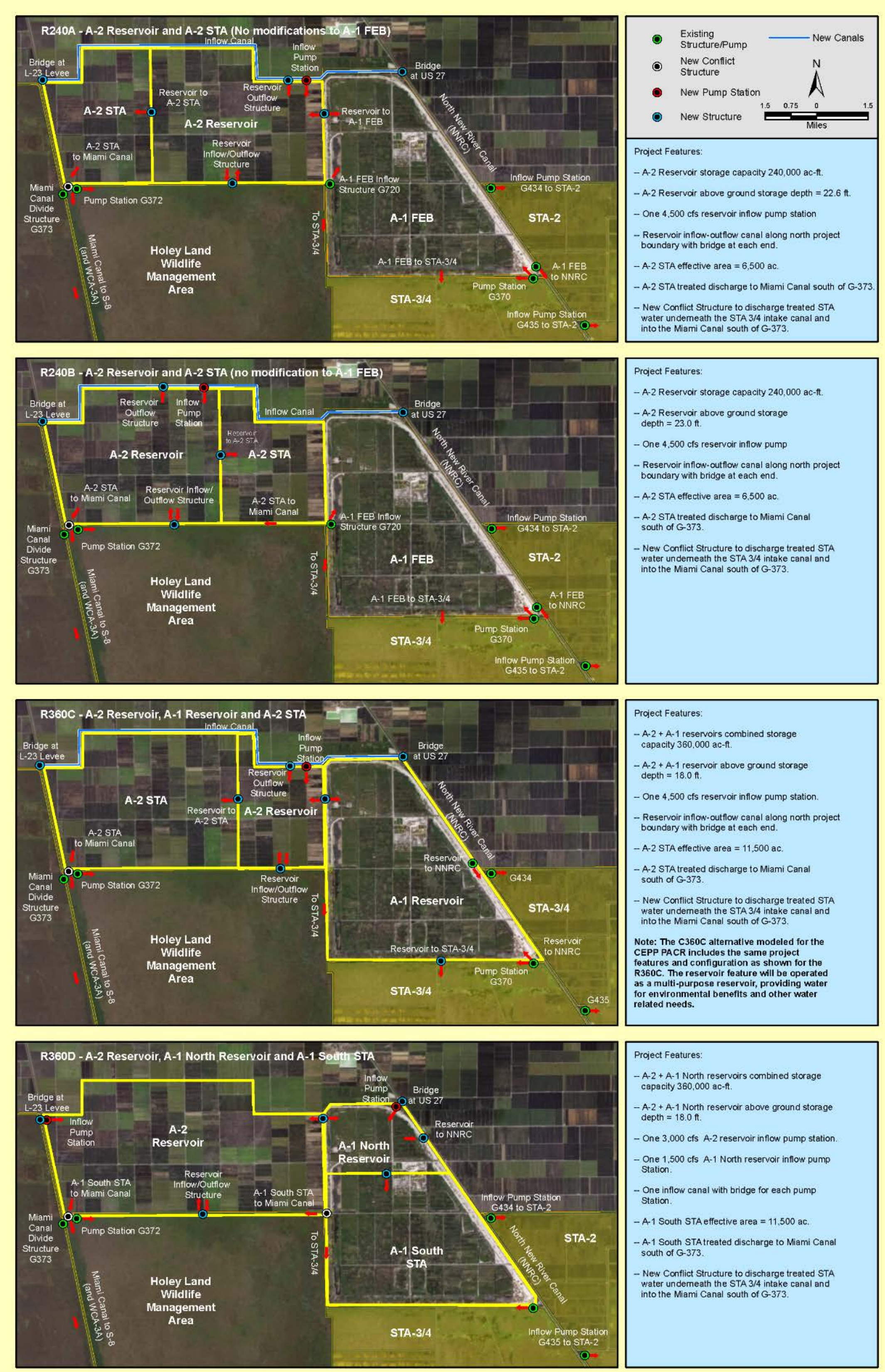

Figure ES-2. CEPP PACR Alternative Plans

The project lands are located between and adjacent to the North New River and Miami canals. This location utilizes existing conveyance features, which would need to be improved, to move water from Lake Okeechobee to the project components and the WCAs. The project lands are adjacent, or in close proximity to, existing water quality treatment facilities (Stormwater Treatment Area [STA] 3/4 and STA 2) that are currently being used for environmental purposes. These facilities were also used in CEPP and create a unique opportunity to optimize operations.

Management measures were compiled from previous CERP components, measures identified during the CEPP planning efforts, and new measures that were identified for the CEPP PACR consistent with study objectives. The primary factors considered for screening out management measures were: 1) if the measures did not sufficiently address project objectives; 2) if land was not in public ownership or was unavailable for public acquisition; or 3) if the management measure would result in unacceptable environmental impacts. Cost estimates were not generated for infeasible measures; consequently, no measures were eliminated solely based on high costs.

The locations of storage and treatment management measures in the CEPP PACR utilized the same primary considerations that were used in previous studies, including CEPP, by identifying the regional geographic location and specific footprint. Considering these studies, the possible regional geographic areas, the specific location for the storage and treatment measures within the EAA was selected based upon the factors that include but are not limited to, existing infrastructure, sociopolitical effects, environmental factors, hydrology, and construction efficiencies. The siting analysis identified the A-1 and A-2 footprints, on the former Talisman lands, and the A-2 Expansion area, partially on former Talisman lands, as being the largest, most efficient, and acceptable footprint for this increment of storage and treatment. In the Senate Committee Report for WRDA 2000 (Senate Rep. 106-362, July 26, 2000), the Committee directed the USACE to maximize use of the Talisman lands acquired by the SFWMD with Department of Interior funding, as well as other EAA lands held by the non-Federal sponsor, for the design and construction of the EAA Storage Reservoir. Further, the Committee directed the USACE to take full advantage of the Talisman lands by maximizing the depth of water stored on these lands.

As shown in **Figure ES-2**, five alternatives were evaluated: R240A, R240B, R360C, R360D and C360C. These alternatives consisted of two configurations with 240,000 ac-ft of storage and three configurations with 360,000 ac-ft of storage, including one multi-purpose alternative (C360C) (i.e., water for environmental benefits and other water-related needs). The 240,000 ac-ft configurations were contained within the A-2 parcel (14,500 acres) and A-2 Expansion area (3,500 acres) for a total of 18,000 acres. The 360,000 ac-ft configurations included the A-1 parcel (16,500 acres), A-2, and A-2 Expansion area lands for a total of approximately 35,000 acres of land. Through optimization, modeling of a final alternative was performed that applied the multi-purpose functionality to the 240,000 ac-ft configurations.

The Dynamic Model for Stormwater Treatment Areas modeling results identified that a new 6,500-acre STA was needed for the additional flows through the 240,000 ac-ft storage reservoir and a new 11,500-acre STA for the 360,000 ac-ft storage reservoir. The R240 alternatives include a 10,500-acre reservoir and the R360 and C360 alternatives include a 20,500-acre reservoir.

BENEFITS OF THE TENTATIVELY SELECTED PLAN

The TSP (**Figure ES-3**), a 240,000 ac-ft reservoir with multi-purpose operational flexibility, 6,500-acre STA, and conveyance improvements, would beneficially affect more than 1.5 million acres in the St. Lucie and Caloosahatchee Estuaries, WCA 3A, WCA 3B, ENP, and Florida Bay.

Figure ES-3. CEPP PACR Tentatively Selected Plan

High-flow discharges lasting more than 60 days in the Caloosahatchee Estuary or more than 42 days in the St. Lucie Estuary have been found to be particularly damaging to the oyster populations. The TSP would reduce high-flow discharge events to the Northern Estuaries lasting more than 60 days to the Caloosahatchee Estuary by 40% and would provide a 55% reduction in high-flow discharge events lasting more than 42 days in the St. Lucie Estuary, in addition to the benefits provided by the previously authorized projects.

The TSP also reduces the number, return frequency and severity of undesirable, damaging, high-volume discharges from Lake Okeechobee, improving salinity and water quality conditions in the St. Lucie and Caloosahatchee Estuaries. The positive effects on water front property values, tourism, recreation, marine, and other industries; and the overall health of the Northern Estuaries would have a direct improvement on the economics of these regions. In combination with the previously authorized projects, the CEPP PACR TSP approaches the CERP goal of approximately 80% reduction in damaging discharges to the Northern Estuaries, by providing a 55% reduction in discharge volumes and a 63% reduction in mean monthly high-flow discharge events to the Northern Estuaries from Lake Okeechobee. Salinity conditions in the estuaries would also be improved by reducing the number of Lake Okeechobee events that exceed the preferred salinity envelope by 45% in the Caloosahatchee Estuary and 39% in the St. Lucie Estuary.

In addition to reducing damaging discharges to the Northern Estuaries, the TSP would increase CEPP flows from an average annual flow of approximately 210,000 ac-ft, approximately two-thirds of CERP flows, to an average annual flow of approximately 370,000 ac-ft. This provides a significant increase in the quantity of water flowing to the central Everglades, which is essential to Everglades Restoration and achieves the CERP goal.

The additional water flowing into northern WCA 3A and ENP provided by the TSP would help to restore vegetative communities, habitat for fish and wildlife, all while providing additional improvement of natural processes critical for the development of peat soils and tree islands, which are essential features of the Everglades ridge and slough landscape. Additional overland flows and operational refinements in the South Dade system would also improve salinity conditions in Florida Bay.

In total, the TSP combined with other CEPP components provides a total flow of approximately 370,000 ac-ft of “new water” going south on an average annual basis, meeting the CERP goal for flows into the central Everglades. These post authorization changes would further improve ecological conditions in the Northern Estuaries and Greater Everglades system. Ecosystem services provided by the TSP include carbon sequestration, reduced fire risks, improved commercial and recreational fish catches, boating and other recreational use and aesthetic values associated with the Everglades and south Florida’s estuaries. Authorized recreation features on the CEPP A-2 FEB project footprint were reviewed and modified to be compatible with storage and treatment features included in the TSP. Overall, the recreational benefits provided by the authorized CEPP plan, as modified by the TSP, include enhanced outdoor recreation opportunities and improved access to Everglades marshes for tourism and residents of Florida.

The TSP also boosts resiliency to potential sea level rise effects by increasing freshwater in the Everglades and buffering natural system areas and the underlying aquifer against possible sea level rise and changes in rainfall. Although the magnitude of the effects of rising sea levels, temperature changes, and changing rainfall patterns is uncertain, it is generally acknowledged that sea level rise will affect both natural system and human environmental conditions in south Florida during the next century. Although the CERP was formulated in 1999 to address declining conditions in the Greater Everglades ecosystem and restoration of ecological functions without the benefit of the current level of understanding about possible climate change effects and the associated effects on sea level rise, scientists and agency water managers agree that implementation of the plan will provide an important adaptation response for both the natural system and the human environment considering future sea level rise scenarios. For CEPP, Annex I of the CEPP PIR evaluated the effects of sea level rise. As the mean tide level increases, the additional water from CEPP will provide a buffer of freshwater that will limit salinity related impacts to freshwater wetland vegetation, reduce peat soil degradation, and impede saltwater intrusion into the groundwater aquifer. The effects of sea level change were analyzed per Engineering Circular 1165-2-212. This analysis looked at the effect of sea level change on the benefits predicted for the CEPP recommended plan. The results indicate that within a 50-year planning horizon the average annual net project benefits are likely to be reduced by less than 8% in comparison to the projected net annual average project benefits estimated assuming no sea level rise. This relatively moderate decrease in average annual project benefits occurs largely because of closely matching habitat losses that would occur under the future without project condition. Similar conditions are expected for the CEPP PACR TSP.

The TSP fulfills WRDA 2000 Project Assurance requirements (Section 601(h)(4)) by identifying the water to be protected for the natural system (**Table 6-22** in **Section 6.9**). The quantity, timing, and distribution of water are identified at three locations: inflows to WCA 3, inflows to ENP, and overland flows to Florida Bay.

Protection of water made available by CEPP project features is required before the SFWMD and the Department of the Army can enter into one or more PPAs to construct the CEPP PACR project features. The SFWMD has already protected the pre-project water for the natural system in the Holey Land and Rotenberger Wildlife Management Areas; WCA 1, WCA 2A, WCA 2B, WCA 3A, and WCA 3B; and ENP through the Restricted Allocation Area Rule for the Everglades. The SFWMD would protect the water made available by the CEPP PACR project features using its reservation or allocation authority as required by Section 373.470, Florida Statutes. The combination of protecting the pre-project existing water and the new water made available by the CEPP project features is needed for the CEPP to achieve its intended benefits.

The TSP fulfills WRDA 2000 Savings Clause requirements (Sections 601(h)(5)(A) and 601(h)(5)(C)) which, in part, ensure existing legal sources of water supply such as water for municipal, agricultural, and fish and wildlife uses continue to be available with project implementation. Sources of water to meet agricultural and urban demand in Lake Okeechobee and the Lower East Cost Service Areas (LECSA) would continue to be met by their current sources, primarily Lake Okeechobee, the WCAs, surface water in the regional canal network, and the surficial aquifer system. Sources of water for the Seminole Tribe of Florida and Miccosukee Tribe of Indians of Florida would not be affected by the TSP. In addition, water supplies to ENP and water supplies for fish and wildlife located in the Northern Estuaries, WCA 2, WCA 3, and Florida Bay would not be diminished.

The TSP does not reduce the level of service for flood protection, or adversely affect existing legal users consistent with the requirements of WRDA 2000 (Section 601(h)(5)(B)) and Chapter 373.1501 F.S. Comparison of canal stages and groundwater levels at key locations indicate the project would not reduce the flood protection within the areas affected by the project, including the EAA, LECSA 2, and LECSA 3. This includes the Seminole Tribe of Florida's Big Cypress Reservation and the Miccosukee Tribe of Indians of Florida's reservation areas and resort.

ENVIRONMENTAL CONSIDERATIONS

The TSP has been identified to be the environmentally preferable and practicable alternative. All practicable means to avoid or minimize adverse environmental effects were incorporated into the TSP. An Adaptive Management and Monitoring Plan is included in the CEPP PACR as **Annex D**. Temporary short-term impacts to air quality, the noise environment, aesthetic resources, vegetation, and disturbances to and displacement of fish and wildlife resources to other nearby habitat are expected from operation of construction equipment in lands designated for staging, access, and construction. Due to increased water flow and changes in water distribution, it is anticipated that over-drained areas in northern WCA 3A would be rehydrated, triggering a vegetation transition from upland to wetland habitat. Although mammals within the project area are adapted to the naturally fluctuating water levels in the Everglades, there is minimal potential that mammals currently utilizing upland habitat may be negatively affected.

Potential adverse impacts on prime and unique farmland have been minimized and will be assessed during detailed design. No significant direct adverse impacts to wetlands are expected from the construction of the project, wetlands will be gained when agricultural lands are converted to an STA.

To comply with the Endangered Species Act (ESA), the SFWMD has drafted a Biological Assessment (**Annex A**) in preparation for consultation with the U.S. Fish and Wildlife Service. The SFWMD understands that the USACE will be initiating government-to-government consultation upon submittal of the PACR to the Assistant Secretary of the Army Civil Works.

The TSP may have adverse effects on cultural resources, some of which are unavoidable and long term, and/or cannot be assessed until the detailed design phase of the project. Avoidance of adverse effects to cultural resources is preferred, and therefore the project will consider alternatives and features of alternatives that reduce or eliminate impacts to cultural resources. Pursuant to 36 Code of Federal Regulations 800.1, where possible, the project design will be modified to avoid affecting significant historic properties and culturally significant sites. Where avoidance is not possible, other mitigation measures will be considered. Future mitigation measures will be developed during the preconstruction, engineering, and design phase in consultation with the State Historic Preservation Office, tribal groups and other interested parties as established in implementing regulations for Section 106 of the National Historic Preservation Act.

COST ESTIMATE AND IMPLEMENTATION PLAN

The cost to implement the CEPP PACR presented in **Table ES-1** includes the project features for future CEPP PPA North, PPA South and PACR TSP New Water, including recreation features. The costs for CEPP PPA North and PPA South features have been updated to 2018 price levels, for comparison with the CEPP PACR costs. The net increase in cost over the authorized CEPP is **$1,143,000,000**. The first cost of the authorized CEPP, as modified by the PACR TSP, defined as the capital investment costs (2018 price level), is **$3,174,000,000**, including construction, non-construction items, and contingency (**Table ES-1**).

Table ES-1. Estimate of First Costs for Authorized CEPP Plan and CEPP, as modified by the TSP [1,2]

Construction and Operation, Testing, and Monitoring Phase Items	CEPP Costs (2014 Price Level)	CEPP Costs (2018 Price Level)	PACR TSP Costs (2018 Price Level)	CEPP A-2 FEB Costs Removed (2018 Price Level)	CEPP + PACR TSP Costs (2018 Price Level)
Ecosystem Restoration Costs					
03 Reservoirs			$1,208,000,000		$1,208,000,000
6 Fish and Wildlife (monitoring and adaptive management)	$106,000,000	$114,000,000			$114,000,000
08 Roads, Railroads, and Bridges			$15,000,000		$15,000,000
09 Channels & Canals	$370,000,000	$402,000,000	$104,000,000	($181,000,000)	$325,000,000
11 Levees	$399,000,000	$425,000,000	$82,000,000	($193,000,000)	$314,000,000
13 Pumping Plant	$133,000,000	$139,000,000	$150,000,000	($38,000,000)	$251,000,000
15 Floodway Control and Diversion	$342,000,000	$368,000,000	$97,000,000	($126,000,000)	$339,000,000
18 Cultural Resources Preservation	$26,000,000	$27,000,000			$27,000,000
32 HTRW Investigations	$1,000,000	$1,000,000			$1,000,000
Construction Features Sub-Total	**$1,377,000,000**	**$1,476,000,000**	**$1,656,000,000**	**($538,000,000)**	**$2,594,000,000**
Preconstruction Engineering and Design (PED), Engineering During Construction (EDC) and Planning	$345,000,000	$366,000,000	$124,000,000	($148,000,000)	$342,000,000
Construction Management (S&A)	$135,000,000	$143,000,000	$81,000,000	($57,000,000)	$167,000,000
Lands & Damages	$37,000,000	$39,000,000	$22,000,000		$61,000,000
Total Ecosystem Restoration Costs	**$1,894,000,000**	**$2,024,000,000**	**$1,883,000,000**	**($743,000,000)**	**$3,164,000,000**
Recreation Costs					
14 Recreation Facilities	$6,000,000	$7,000,000			$10,000,000
Total First Cost	**$1,900,000,000**	**$2,031,000,000**	**$1,883,000,000**	**($743,000,000)**	**$3,174,000,000**

[1] Construction costs in this table include contingencies.

[2] Costs are rounded to the nearest $1,000,000.

Note that construction costs for several cost codes in **Table ES-1** are lower for the PACR TSP than the authorized CEPP plan. Construction costs for the A-2 FEB in the authorized CEPP plan were included in cost codes 09 (Channels and Canals), 11 (Levees), and 15 (Floodway Control and Diversion). As the A-2 Reservoir and A-2 STA would replace the A-2 FEB in the PACR TSP, estimated A-2 FEB construction costs were deleted from the corresponding cost codes in the PACR TSP column, and cost code 03 (Reservoirs) was added to the PACR TSP column to address construction costs associated with the proposed A-2 Reservoir.

The cost to construct the recreational features is cost-shared. Operations, maintenance, repair, rehabilitation, and replacement (OMRR&R) of recreational features becomes the sole responsibility of the non-Federal sponsor. The average annual cost of the recreation features is $437,800 and the average annual benefits are $1,214,400, resulting in net benefits of $776,700 and a benefit to cost ratio of 2.77 to 1.

Implementation of the authorized CEPP PPA North and PPA South project features would occur over time and includes many actions by the USACE and SFWMD. The new storage and treatment features associated with this PACR could be designed and constructed after authorization and in parallel with the CEPP PPA North and PPA South project features. Development of the sequencing plan for CEPP PACR storage and treatment features considers parallel design and construction activities, and project interdependencies with a number of CERP and non-CERP projects (**Table 6-21 in Section 6.7.1 of the main report**). Certain restoration features must be constructed and operating before achieving the full project benefit and to avoid unintended consequences.

Three PPAs composed of separable project elements that provide hydrologic and ecologic benefits in a parallel and cost-effective manner would be executed in the future prior to construction (**Table ES-2**). These PPAs include the construction of logical groupings of plan elements that maximize benefits to the extent practicable consistent with project dependencies. PPAs are legally binding agreements that describe the roles and responsibilities of the USACE and SFWMD for real estate acquisition, design, construction and operations and maintenance. Other factors that influence implementation include funding availability, cost-share balance between the Federal government and non-Federal sponsor, as well as the integration of projects that are to be constructed by other agencies. These groupings include a PPA for project features (canal conveyance, storage reservoir, and STA) of the PACR TSP (PPA New Water), a PPA for project features in northern WCA 3A (PPA North), and a PPA for project features in southern WCA 3A, 3B, and ENP (PPA South) **(Figure 1-4 of the main report)**.

Table ES-2. Project Features by PPA

PPA North	
L-6 Diversion	
S-8 Pump Modifications	
L-4 Levee Degrade and Pump Station	
L-5 Canal Improvements	
Miami Canal Backfill	
PPA South	
L-67 A Structure North	L-67 C Levee Degrade (approximately 8 miles)
L-67 C Levee Gap (6,000 ft)	Remove L-67 Extension Levee (No Backfill)
Increase S-356 capacity to 1,000 cfs	8.5 Mile Blue Shanty Levee
Increase S-333 capacity	Remove L-29 Levee Segment
L-29 Gated Spillway	Backfill L-67 Extension
L-67 A Structures 2 and 3 South	Remove Old Tamiami Trail[1]
L-67 A Spoil Mound Removal	
PPA New Water	
Seepage Barrier L-31 N	
A-2 Reservoir and STA	
Miami and NNR Canal Conveyance Improvements	

[1] Removal of Old Tamiami Trail can be completed at any time during implementation but must precede backfilling of L-67 Extension Canal.

PPA North and PPA South are expected to achieve regional benefits by utilizing existing inflows to improve deliveries to WCA 3, ENP, and Florida Bay. PPA North includes the hydropattern restoration features in northern WCA 3A and the backfilling of the Miami Canal. Construction of these features that redistribute inflows into WCA 3A provide the benefits identified in the TSP associated with restoration of hydroperiods in northern WCA 3A, associated reduction in the risk of muck fires, and restoration of more natural sheetflow. A limited portion of these benefits could be realized through improvements in the redistribution and delivery of water currently entering northwest WCA 3A prior to bringing in any additional water from Lake Okeechobee.

Features of the PPA South would include conveyance features that function to re-distribute water from WCA 3A to WCA 3B and ENP. Benefits from PPA South facilities would be realized within WCA 3A, WCA 3B, and Northeast Shark River Slough from the added outlet capacity. Improved hydrologic conditions in ENP are expected to result in modest improvements in salinity conditions in Florida Bay.

The ability to increase flows to the south as envisioned with the TSP depends on the construction of the A-2 Reservoir and A-2 STA and the seepage wall in PPA New Water, as well as the distribution and conveyance features in PPA North and PPA South. Implementation of all three PPAs is necessary to realize all of the CEPP PACR improvements associated with the reduction of undesirable high-volume discharges to the Northern Estuaries and the restoration of hydroperiods and sheetflow in WCA 3 and ENP. The total benefits predicted with implementation of the TSP cannot be achieved without the combination of storage and treatment, distribution and conveyance, and seepage management.

Similar to the authorized CEPP, uncertainty surrounding the timing of project dependencies, funding, resources, and stakeholder input could likely lead to an extended implementation period for the CEPP PACR project components. **Figure ES-4** includes an implementation scenario with unconstrained resources and funding to demonstrate the duration of construction. **Figure ES-5** illustrates the construction duration associated with implementation sequentially constructing PPA North, then PPA South and finally PPA New Water and assuming constrained project funding of $164 million per year ($50 million Federal and $114 million non-Federal sponsor). The design and construction of the CEPP PACR conveyance improvements, storage reservoir, and STA could be done in parallel with the components of the PPA North and South and L-31N Seepage Barrier Project (**Figure ES-4**); however, full operation and benefits are contingent upon completion of interdependent features.

Other viable options for the implementation of groupings into PPAs may be considered in the future. This flexibility is essential to successful CEPP implementation given the uncertainties associated with the lengthy implementation period and the ongoing improvement in scientific knowledge about the functioning of the greater Everglades that will occur as planned CERP and non-CERP projects are completed. The USACE and the SFWMD will incorporate the CEPP PPA North and South features and the CEPP PACR and other CERP projects awaiting authorization into the south Florida ecosystem restoration programs integrated delivery schedule.

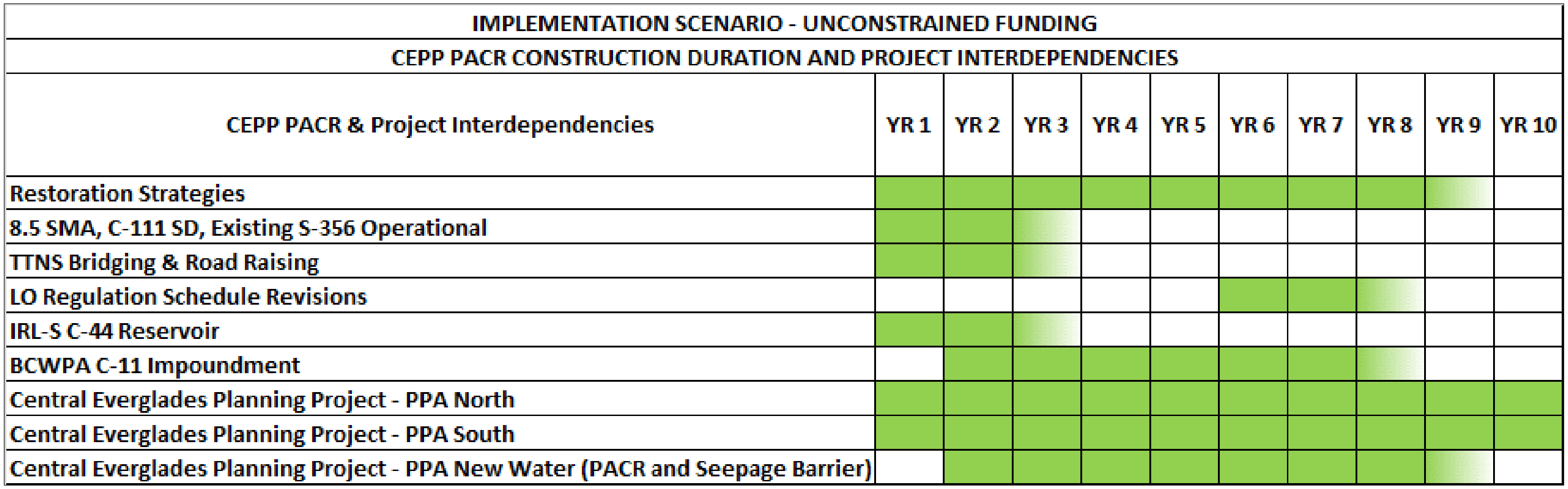

Figure ES-4 CEPP PACR Unconstrained Construction Duration and Project Interdependencies

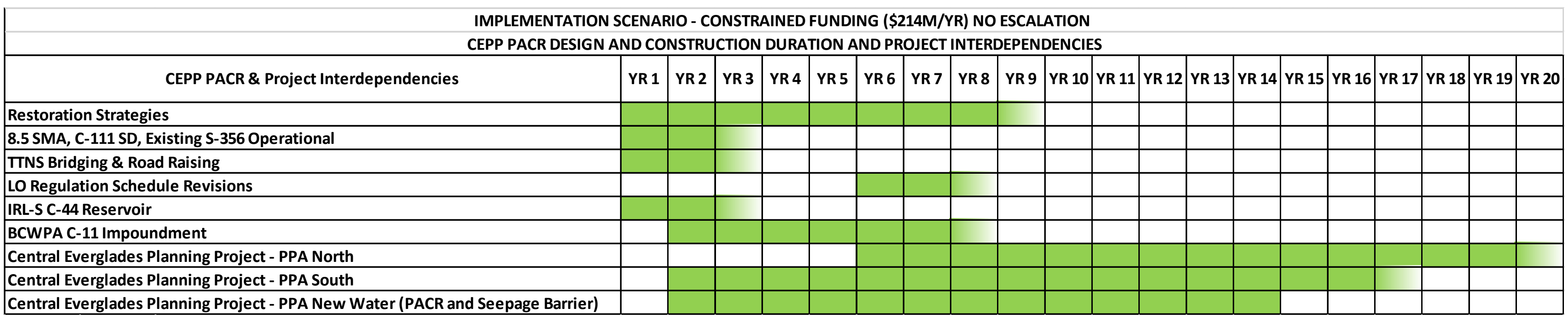

Figure ES-5. CEPP PACR Constrained Construction Duration and Project Interdependencies

COORDINATION WITH AGENCIES AND THE PUBLIC

The expedited planning process for the CEPP PACR study required extensive coordination with the public and Federal, Tribal, State, and local resource management and regulatory agencies. An interagency study team was formed and met during the study, providing Federal, Tribal, State, and local agencies opportunities to comment on planning assumptions, evaluation tools and methods, and alternative plans. The SFWMD's Governing Board and Water Resources Analysis Coalition (WRAC) also met monthly throughout the study, providing opportunities for information to be provided to elected and appointed officials and the public. The CEPP PACR study team presented at numerous public meetings (October 2017 – February 2018) summarizing the alternative plans, the TSP, and effects.

Initial public and agency comments received in response to Florida Administrative Weekly public notices and collected throughout the scoping period were mostly supportive of the project. Comments focused on the uncertainty in the expedited planning process, sufficient water quality features, links to other CERP projects, and planning constraints. Two public scoping workshops consistent with National Environmental Policy Act were held in October 2017. Additional public workshops and project update meetings were held in November and December 2017 to receive comments on the array of alternatives. In total, 10 public meetings were held in South Florida and public comments, questions, and answers were addressed. The PACR TSP was presented in February 2018. Stakeholders, local governments, and representatives of nongovernmental environmental organizations provided verbal, written comments and statements. The primary concerns centered on the need to store water north of Lake Okeechobee, move as much water south as possible, reduce releases to the Caloosahatchee and St. Lucie Estuaries, meeting water quality standards for the Everglades, the effect of water levels on recreation opportunities, and impacts to water supply.

PUBLIC AND STAKEHOLDER FEEDBACK

PROVIDING ADDITIONAL REGIONAL ECOSYSTEM RESTORATION NEEDS

Although the PACR TSP provides an increase in freshwater needed for the restoration of the Greater Everglades and Florida Bay, it is clear that additional actions are needed to further reduce undesirable discharges of freshwater from Lake Okeechobee to the St. Lucie and Caloosahatchee Estuaries. This can be done in conjunction with other CERP components such as Lake Okeechobee Watershed Restoration Project and Western Everglades Restoration Project, and additional storage associated with other CERP components.

APPROPRIATE SIZING OF PROJECT FEATURES

During the development of the alternatives for the CEPP PACR, stakeholders expressed concerns about the appropriate sizing of the STA facility needed for water quality treatment in order to ensure that the additional flows to be sent south to the Everglades Protection Area meet State water quality standards. Several technical considerations including diversions, loading of existing STAs, concurrence between models, and phosphorus settling rates, were expressed and accounted for in final plan selection to ensure project benefits are delivered. Through refinement of the modeling effort, the size of the STA was increased for all alternatives to ensure water quality treatment facilities are adequate, sized appropriately, and in compliance with State water quality standards. Proposed operations of the TSP efficiently integrate the new facilities (A-2 Reservoir and A-2 STA) with the existing State Facilities (A-1 FEB, STA-2 and STA-3/4) to meet the objectives of the project.

PROJECT FOOTPRINT

Several stakeholders requested that additional lands be acquired for inclusion in the project. The SFWMD has pursued willing sellers and land exchanges within the EAA in an effort to increase the acreage available for the project. SFWMD is expected to acquire the privately held lands from both of the private landowners in the A-2 Expansion area. With the addition of the A-2 Expansion area to the Talisman Compartment A-2 lands that are in public ownership, the total land area for the PACR TSP is larger than the land area required for the currently authorized A-2 FEB in the CEPP plan. The Legislature directed SFWMD to take several real estate actions to facilitate the planning and implementation of the EAA Storage Reservoir project. The requirements for real estate actions generally included the pursuit of willing sellers, termination of leases on State lands, and land exchanges. SFWMD fulfilled these requirements, while maximizing the use of previously acquired land already in public ownership and adjacent to existing infrastructure. Based on the analysis performed, additional lands are not required to achieve the benefits of the TSP.

ADDITIONAL STORAGE NORTH OF THE LAKE

Early in the development of the feasibility study, and throughout public involvement, stakeholders continually identified the need for storage north of Lake Okeechobee. While the CEPP PACR does not address management measures north of the Lake, the USACE and SFWMD are pursuing additional studies and planning projects to evaluate storage options in addition to the proposed CEPP PACR project features.

WATER QUALITY AND EFFECTS ON STATE FACILITIES

The PACR TSP includes a new STA to support delivery of “new water” to the central Everglades through WCA 3A. The authorized CEPP plan also depends on non-Federal water quality treatment facilities owned and operated by the State of Florida (STAs 2 and 3/4) and is integrated with the A-1 FEB included in the State of Florida’s “Restoration Strategies” program. The authorized CEPP plan, as modified by the PACR TSP, would use the new STA in conjunction with these State facilities to process the “new water” for ecosystem restoration purposes. To achieve the CERP restoration goal, the PACR TSP would increase flow into the central Everglades to approximately 370,000 ac-ft on an average annual basis, compared to approximately 210,000 ac-ft per year for the authorized CEPP plan. Discharges into WCA 3A must meet State water quality standards. To ensure that the PACR TSP achieves State water quality standards, discharge permits with associated effluent limits would govern discharges from both the new STA and existing State facilities.

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1.0 INTRODUCTION

The intent of this Integrated Feasibility Study and Draft Environmental Impact Statement (FS/DEIS) is to evaluate and propose a post authorization change to the Central Everglades Planning Project (CEPP), which was authorized by Congress in the Water Infrastructure Investments for the Nation (WIIN) Act of 2016, which includes the Water Resources Development Act (WRDA) of 2016 as Title I. The Integrated FS/DEIS will hereafter be called the CEPP Post Authorization Change Report (PACR). This CEPP PACR has been prepared by the South Florida Water Management District (SFWMD) for submittal to the Assistant Secretary of the Army for Civil Works (ASA[CW]) for review, approval, and subsequent transmittal to Congress for authorization under Section 203 of the WRDA of 1986, as amended. Pertinent background information on the Comprehensive Everglades Restoration Plan (CERP) and the CEPP, which represents a significant increment of CERP implementation, will be presented in **Sections 1.1** and **1.2**.

The overall purpose of the CEPP PACR is to further improve the quantity, quality, timing, and distribution of water flows from Lake Okeechobee to the St. Lucie and Caloosahatchee Estuaries (Northern Estuaries), the Greater Everglades (Water Conservation Area 3 [WCA 3] and Everglades National Park [ENP]), and Florida Bay while maintaining flood control and water supply for existing legal users. The purpose and need for the proposed post authorization change to CEPP is discussed in more detail in **Section 1.3**.

1.1 PROJECT BACKGROUND

The Everglades ecosystem has been altered by 120 years of highly effective efforts to address flood protection and water supply needs in south Florida through implementation of the Federally authorized Central and Southern Florida project (C&SF Project). As a result, south Florida, including the remaining Everglades ecosystem, no longer exhibits the functionality, richness, and spatial extent that historically defined the pre-project system. The spatial extent of the ecosystem has been reduced by almost 50% as a result of development and agriculture. These land impacts were possible because of water management activities intended to provide flood protection and water supply to both developed and agricultural areas (**Figure 1-1**).

Water that once flowed from Lake Okeechobee south through the Everglades, down Shark River Slough (SRS), and to the Southern Estuaries has been impounded in the lake and discharged to the Northern Estuaries (i.e., Caloosahatchee and St. Lucie Estuaries) via regulatory releases through the C-43 and C-44 canals. Prolonged high-volume discharges of water from Lake Okeechobee to the Northern Estuaries coupled with excessive nutrient concentrations in Lake Okeechobee water and downstream basin water have resulted in damaging effects on the plants and animals inhabiting these areas. The damage to the ecosystem negatively affects the economy of the area and will take years to correct. Prolonged high-volume discharges of water from Lake Okeechobee to the Northern Estuaries resulted in significant hydrologic changes south of the lake. The reduction in sheet flows across the Everglades changed the landscape through the loss of peat ("muck"), freshwater marshes, tree islands, and native flora and fauna, and the proliferation of invasive species. Loss of freshwater inflow to Florida Bay, south of the Everglades, increased the Bay's salinity with adverse effects on estuarine species. Independently, south Florida agricultural practices resulted in excessive nutrient concentrations in Lake Okeechobee and downstream basin water resulting in additional damage to the flora and fauna inhabiting these areas.

Condition	Acreage
Pre-Drainage	2,730,000
1940	2,220,000
~2003	1,540,000

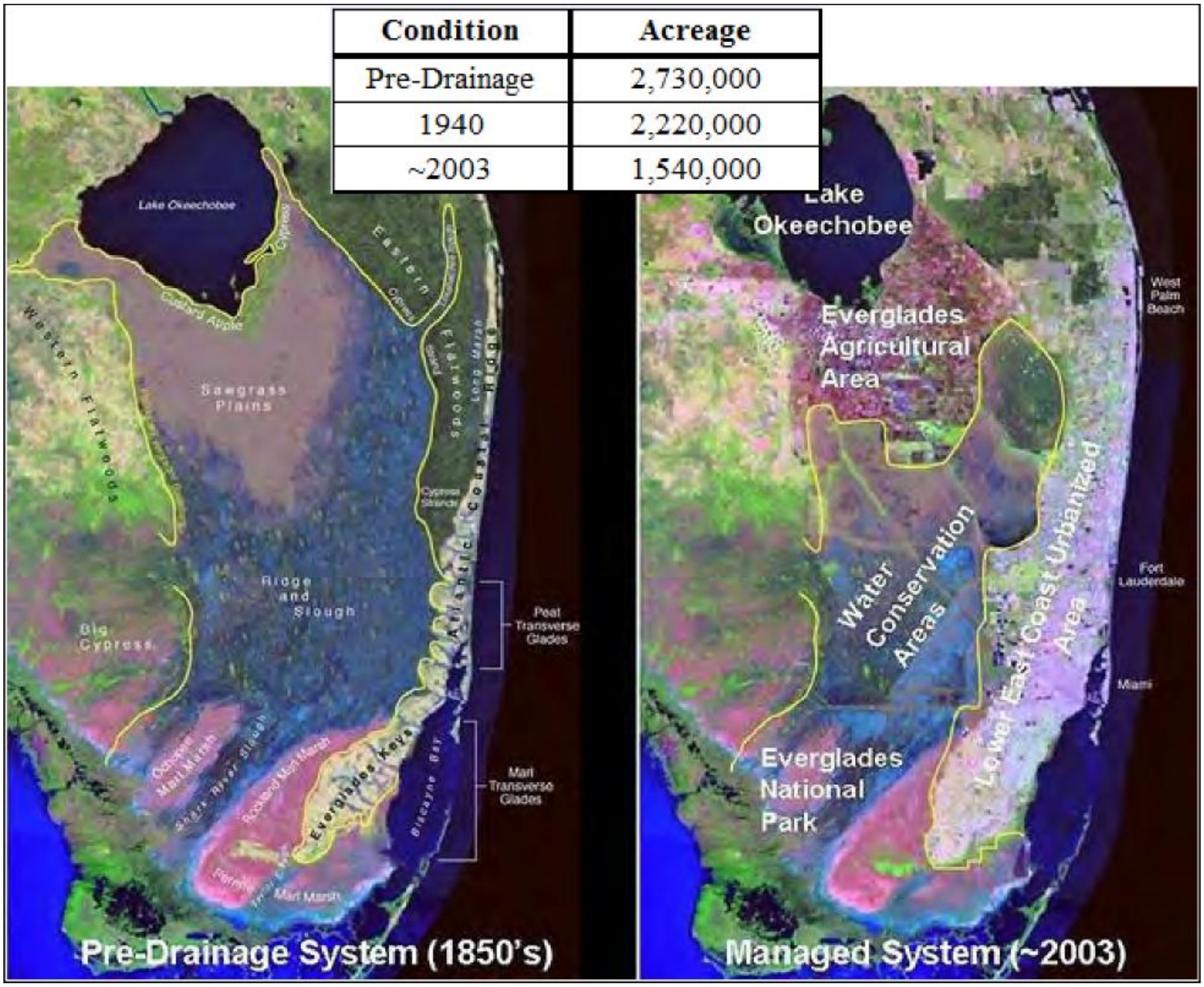


Figure 1-1. Land Changes in the Everglades System

The CERP was approved by Congress as a framework for the restoration of the natural system under Section 601 of the Water Resources Development Act of 2000 (WRDA 2000). The CERP, as documented in the 1999 C&SF Project Comprehensive Review Study Final Integrated Feasibility Report and Programmatic Environmental Impact Statement (Yellow Book), consists of 68 different components. The purpose of the CERP is to modify structural and operational components of the C&SF Project to achieve restoration of the Everglades and the south Florida ecosystem, while providing for other water-related needs such as urban and agricultural water supply and flood protection. The 68 components identified in the Yellow Book, which include storage, treatment, seepage management, conveyance modifications, among others, will work together to restore the ecological structure and function of more than 2.4 million acres of the south Florida ecosystem by improving and/or restoring the proper quantity, quality, timing, and distribution of water in the natural system. The CERP will also address other concerns such as urban and agricultural water supply and maintain existing levels of service for flood protection in those areas served by the project. The CERP components were originally planned for implementation over an approximately 40-year period. The CERP is designed to restore more natural flows by re-directing water currently discharged to the Atlantic Ocean and Gulf of Mexico, to a southern flow across the Everglades similar to pre-drainage conditions that were altered by the Federally authorized C&SF Project to address flood protection and water supply needs in south Florida (**Figure 1-2** and **Figure 1-3**).

Since the authorization of CERP in WRDA 2000:

- Three projects were authorized in WRDA 2007 and proceeded into construction (Indian River Lagoon-South, Picayune Strand, and Site 1 Impoundment) and a fourth project, Melaleuca and Other Exotic Plants Biological Controls, was implemented under the programmatic authority in WRDA 2000.
- Four projects were authorized in the Water Resources Reform and Development Act (WRRDA) of 2014. The Caloosahatchee River (C-43) West Basin Storage Reservoir, Biscayne Bay Coastal Wetlands Phase I Project, and C-111 Spreader Canal Western proceeded into construction and detailed design began on the Broward County Water Preserve Area Project.

The CEPP Project Implementation Report (PIR) was initiated by the U.S. Army Corps of Engineers (USACE) in 2011 in partnership with the SFWMD, the non-Federal sponsor for CERP. The PIR was completed in December 2014, the Chief of Engineers report was signed on December 23, 2014, and CEPP was subsequently authorized by Congress for construction in Section 1401(4) of the WIIN Act of 2016 (commonly known as WRDA 2016). The overall purpose of CEPP was to develop a plan to reverse over 120 years of human-induced environmental degradation within the central portion of the globally significant Everglades ecosystem. Restored water depth, duration and distribution in Water Conservation Area (WCA) 3A, WCA 3B and Everglades National Park (ENP) would serve to reestablish a landscape characteristic of a pre-drained system that would support a healthy mosaic of plant and animal life. The restored hydrology of the Everglades ecosystem would more closely resemble a natural occurring rainfall driven system with wet and dry cycles essential to flora and fauna propagation. Improved water depth and sheet-flowing distribution would begin to re-establish the unique ridge, slough and tree island micro-topography that once provided sustenance to the vast diversity of the species inhabiting the Everglades.

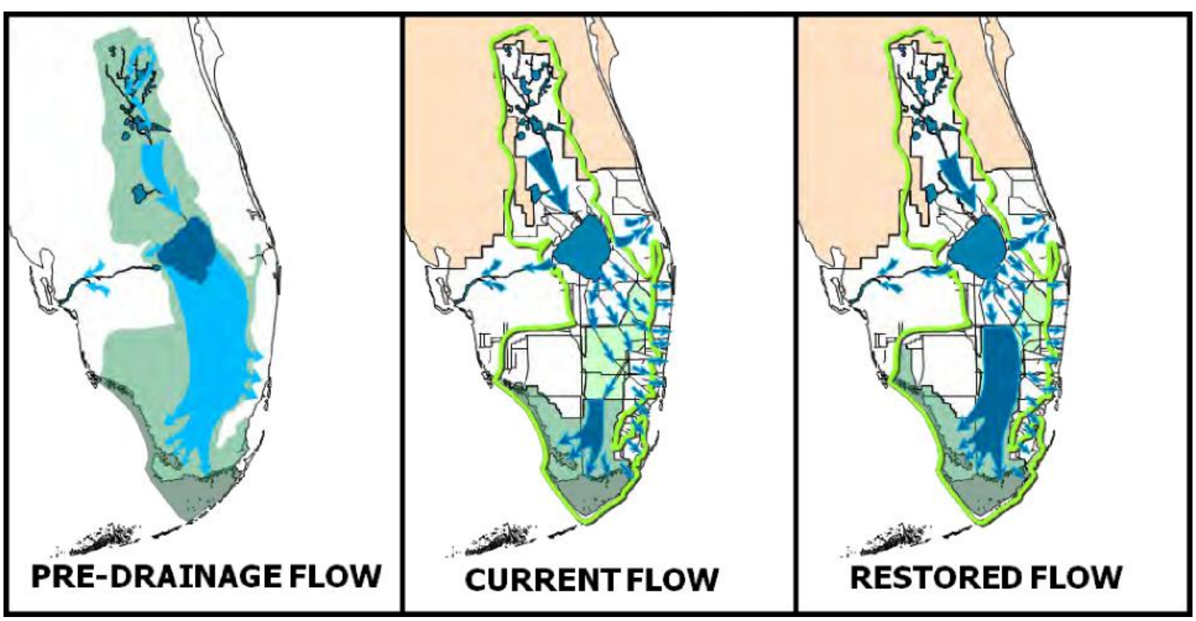
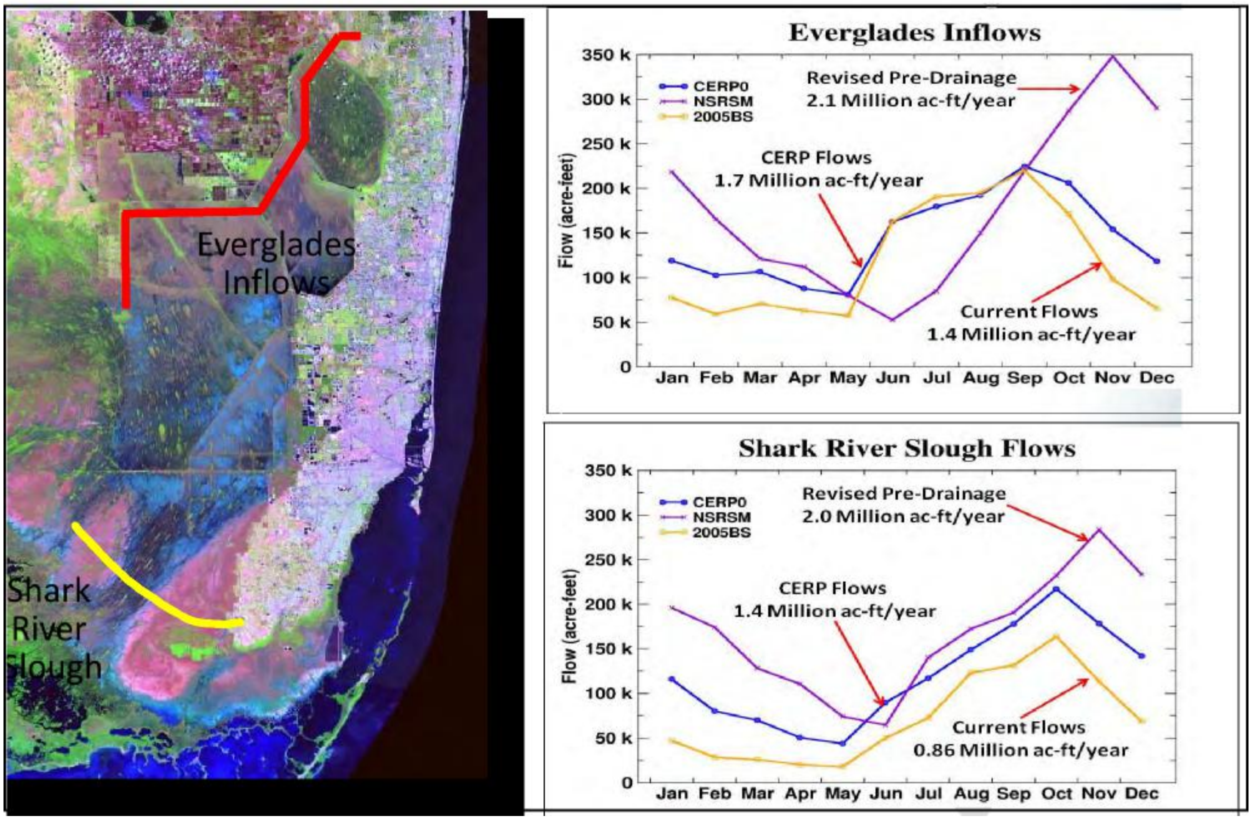


Figure 1-2. Pre-drainage, Current, and Restored Flows to Illustrate CERP Restoration



NOTE: The CERP "0" is similar to CERPA performance in changing the timing of flows to the natural system.

Figure 1-3. Water Flow Changes in the Everglades System under CERP

Further, the authorized CEPP plan would benefit the Caloosahatchee and St. Lucie Estuaries by decreasing the number and severity of high-volume regulatory flood control releases sent from Lake Okeechobee. This would be accomplished by redirecting approximately 210,000 acre-feet (ac-ft) of additional water on an average annual basis to the historical southerly flow path south through flow equalization basins (FEBs) and existing stormwater treatment areas (STAs). The STAs reduce phosphorus concentrations in the water to meet required State water quality standards. Rerouting this treated water south and redistributing it across the degraded L-4 Levee would facilitate hydropattern restoration in WCA 3A. This, in combination with Miami Canal backfilling and other CEPP components, is paramount to re-establishing a 500,000-acre flowing system through the northernmost extent of the remnant Everglades. The treated water would be distributed through WCA 3A to WCA 3B and ENP via new gated control structures and creation of the Blue Shanty Flowway. The Blue Shanty Flowway would restore continuous sheet-flow and re-connect a portion of WCA 3B to ENP.

1.2 DESCRIPTION OF THE AUTHORIZED CENTRAL EVERGLADES PLANNING PROJECT

The following paragraphs provide a description of the components of the authorized CEPP plan. The components are organized into four geographic areas: north of the Red line, south of the Red line, the Green/Blue lines, and along the Yellow line. These geographic areas and the associated plan components are depicted on **Figure 1-4**. Additional detailed information on the CEPP plan is presented in the CEPP PIR (December 2014).

a. Everglades Agricultural Area (EAA) (North of the Red line) includes construction and operations to divert, store and treat Lake Okeechobee regulatory releases.

Storage and treatment of new water is currently authorized with the construction of a 14,000-acre FEB and associated distribution features on the A-2 footprint that is operationally integrated with the State-owned and State-constructed A-1 FEB and existing STAs. The A-2 FEB would accept EAA runoff and a portion of the Lake Okeechobee water currently discharged to the estuaries. This Lake Okeechobee water would be diverted to the FEB when FEB/STAs and canals have capacity. The C-44 Reservoir also collects water that would go to the St. Lucie Estuary, and CEPP modifies operations of the reservoir to return a portion of this water back to Lake Okeechobee, from which water can be delivered to the FEB or used to provide water supply deliveries.

CEPP benefits gained from sending new water south from Lake Okeechobee are derived in part from operational refinements that can take place within the existing, inherent flexibility of the 2008 Lake Okeechobee Regulation Schedule (LORS), and in part with refinements that are beyond the schedule's current flexibility. Modifications to 2008 LORS would be required to optimally utilize the added storage capacity of the A-2 FEB to send approximately 210,000 ac-ft on an average annual basis of new water available in CEPP south to the Everglades, while maintaining compliance with Savings Clause requirements for water supply and flood control performance levels. The WRDA 2000 authorization for CERP requires the inclusion of a Savings Clause analysis within each CERP PIR. The Savings Clause protects existing legal sources of water supply, such as water for municipal and agricultural uses, and ensures that CERP implementation does not reduce the level of service for flood protection.

The hydrologic modeling conducted to optimize system-wide performance for all the CEPP alternatives considered in detail in the CEPP PIR incorporated the current Regulation Schedule management bands of the 2008 LORS. The hydrologic modeling of the CEPP alternatives included proposed revisions to the 2008 LORS flow chart guidance of maximum allowable discharges, which are dependent on the following criteria:

- Class limits for Lake Okeechobee inflow and climate forecasts, including tributary hydrologic conditions, seasonal climate outlook, and multi-seasonal climate outlook
- Stage level, as delineated by the Regulation Schedule management bands
- Stage trends (whether water levels are receding or ascending)

Most of the 2008 LORS refinements applied in the CEPP modeling lie within the bounds of the operational limits and flexibility available in the current 2008 LORS, with the exception of the adjustments made to the class limits for the Lake Okeechobee inflow and climate forecasts. Under some hydrologic conditions, the class limit adjustments made to the Lake Okeechobee inflow and climate forecasts reduced the volume of allowable discharges from the Lake, thereby resulting in storage of additional water in the Lake in order to optimize system-wide performance and ensure compliance with Savings Clause requirements. However, these class limit changes represent a change in the flow chart guidance that extends beyond

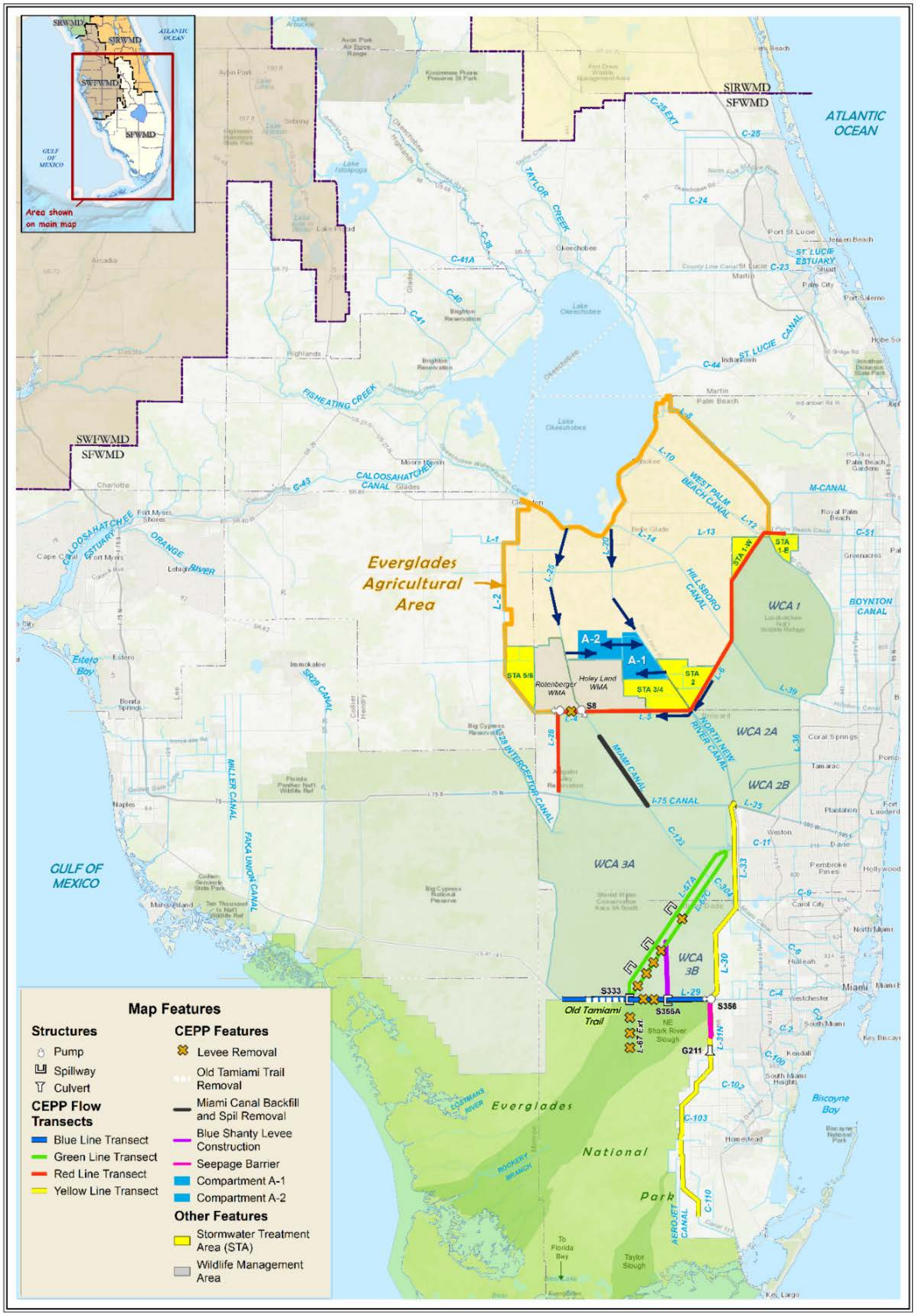


Figure 1-4. The Authorized CEPP Plan

the inherent flexibility in the current 2008 LORS. The authorized plan operations also expand on the 2008 LORS backflow operations to Lake Okeechobee through the following operational changes: (1) backflow to Lake Okeechobee from the C-44 Canal is allowed when S-308 is not open for regulatory discharge and the stage in Lake Okeechobee is below 14.5 feet (ft) National Geodetic Vertical Datum (NGVD) (no seasonal variability); and (2) discharges from the Indian River Lagoon-South Project C-44 Reservoir to the C-44 Canal are made when the stage in Lake Okeechobee is below the baseflow zone of the 2008 LORS schedule to provide an additional source of backflow water to Lake Okeechobee.

Independent of CEPP implementation, there is an expectation that revisions to the 2008 LORS would be needed following the implementation of other CERP projects and Herbert Hoover Dike (HHD) infrastructure remediation. Consistent with the Integrated Delivery Schedule, the USACE expects to operate under the 2008 LORS until there is a need for revisions due to the earlier of either of the following actions: (1) system-wide operating plan updates to accommodate CERP projects (described in more detail in **Section 2.5** of this report), or (2) completion of sufficient HHD remediation and associated culvert improvements (described in more detail in Section 2 of the CEPP PIR). When HHD remediation is completed and the HHD Dam Safety Action Classification (DSAC) Level 1 rating is lowered, higher maximum lake stages and increased frequency and duration of high lake stages may be able to provide the additional storage capacity assumed with the authorized plan. The future LORS which may be developed in response to actions (1) and/or (2) is unknown at this time. It is anticipated that the need for modifications to the 2008 LORS would be initially triggered by non-CEPP actions and that these actions would occur earlier than implementation of CEPP. Therefore, the CEPP PIR would not be the mechanism to propose or conduct the required National Environmental Policy Act (NEPA) evaluation of modifications to the LORS. However, depending on the ultimate outcome of these future LORS revisions, including the level of inherent operational flexibility provided with these revisions, CEPP implementation may still require further LORS revisions to optimize system-wide performance and ensure compliance with Savings Clause requirements.

a. **Northern WCA 3A** (South of the Red line) includes conveyance features to deliver and distribute existing flows and the redirected Lake Okeechobee water through WCA 3A.

The key features to ensure spatial distribution and flow directionality of the water entering WCA 3A are (1) backfilling 13.5 miles of the Miami Canal between I-75 and 1.5 miles south of the S-8 pump station and (2) converting the L-4 Canal into a spreader canal by removing 2.9 miles of the southern L-4 levee.

Conveyance features to move water into and through the northwest portion of WCA 3A include: a gated culvert to deliver water from the L-6 Canal to the remnant L-5 Canal, a new gated spillway to deliver water from the remnant L-5 Canal to the western L-5 Canal (during L-6 diversion operations); a new gated spillway to deliver water from STA 3/4 to the S-7 pump station during peak discharge events (eastern flow route is not typically used during normal operations), including L-6 diversion operations; approximately 13.6 miles of conveyance improvements to the L-5 Canal; a new 360 cubic feet per second (cfs) pump station to move water within the L-4 Canal to maintain water supply deliveries to retain the existing functionality of STA-5 and STA-6 and maintain water supply to existing legal users, including the Seminole Tribe of Florida; and new gated culverts and an associated new canal to deliver water from the Miami Canal (downstream of S-8, which pulls water from the L-5 Canal) to the L-4 Canal, along with potential design modifications to the existing S-8 and G-404 pump stations.

The Miami Canal would be backfilled to approximately 1.5 ft below the peat surface of the adjacent marsh. Spoil mounds on the east and west side of the Miami Canal from S-8 to I-75 would be used as a source for Miami Canal backfill material. Refuge for mammals and other upland species would continue to be provided by the retention of 22 of the highest priority Florida Fish and Wildlife Conservation Commission (FWC) enhanced spoil mounds between S-339 (located approximately 10 miles south of S-339) to I-75 and the creation of additional upland landscape (constructed tree islands) approximately every mile along the entire reach of the backfilled Miami canal section (S-8 to I-75) where historic ridges or tree islands once existed. The constructed tree islands would block flow down the backfilled canal due to the tree island having a profile across the landscape that varies, or undulates, in elevation. Miami Canal constructed tree island design details would be determined during the CEPP preconstruction engineering and design (PED) phase. Tree island design, construction, and planting would be coordinated with science team members with expertise to ensure the success of the restoration vision and intent of CEPP's canal backfilling and tree island construction. A diverse array of species would be planted, including trees, shrubs, and herbaceous species that are appropriate for these tree islands.

b. **Southern WCA 3A, WCA 3B, and ENP** (Green/Blue lines) includes conveyance features to deliver and distribute water from WCA 3A to WCA 3B and ENP.

A new Blue Shanty Levee extending from Tamiami Trail northward to the L-67A Levee would be constructed. This Blue Shanty Levee would divide WCA 3B into two subunits, a large eastern unit (3B-E) and a smaller western unit, the Blue Shanty Flowway (3B-W). A new levee is the most efficient means to restore continuous southerly sheetflow through a practicable section of WCA 3B and alleviates concerns over effects on tree islands by maintaining lower water depths and stages in WCA 3B-E. The width of the 3B-W flowway is aligned to the width of the downstream 2.6-mile Tamiami Trail Next Steps bridge, optimizing the effectiveness of both the flowway and bridge. In the western unit, construction of two new gated control structures on the L-67A, removal of the L-67C and L-29 Levees within the flowway, and construction of a gated spillway in the L-29 Canal would enable continuous sheetflow of water to be delivered from WCA 3A through WCA 3B-W to ENP. A third gated control structure in the L-67A Levee and associated gap in the L-67C Levee, both outside the flowway, would improve the hydroperiod of the eastern unit of WCA 3B. Spoil mounds along the northwestern side of the L-67A Canal, in the proximity to the three new L-67A structures would also be removed to facilitate sheetflow connectivity with the WCA 3A marsh.

An additional gated spillway (S-333N) adjacent to the S-333 structure at the terminus of the L-67A Canal, removal of approximately 5.5 miles of the L-67 Extension Levee, and removal of approximately 6 miles of Old Tamiami Trail between the ENP Tram Road and the L-67 Extension Levee would facilitate additional deliveries of water from WCA 3A directly to ENP. Detailed design and construction of these features would minimize project footprints due to the nature of these environmentally sensitive areas.

c. **Lower East Coast Protective Levee** (Yellow line) includes features primarily for seepage management, which are required to mitigate for increased seepage resulting from the additional flows into WCA 3B and ENP.

A newly constructed pump station with a combined capacity of 1,000 cfs would replace the existing temporary S-356 pump station, and a 4.2-mile partial depth seepage barrier would be built along the L-31N Levee south of Tamiami Trail.

In 2012, as mitigation to offset impacts authorized under a Clean Water Act (CWA) Section 404 permit, the Miami-Dade Limestone Products Association (Association) constructed two miles of a 36-ft-deep seepage barrier between the L-31N Canal and the adjacent levee bordering Everglades National Park, just south of Tamiami Trail. In 2016, the Association completed extension of an additional three miles of the 36-foot-deep seepage barrier to the south. The capability and effectiveness of the existing seepage wall to mitigate seepage losses from ENP is still being studied, the authorized CEPP plan conservatively includes an approximately 4.2-mile-long, 35-ft-deep tapering seepage barrier in the event construction is necessary. There are remaining uncertainties about the effectiveness of the CEPP plan's seepage cutoff wall in maintaining desired stages in marshes of ENP while maintaining flood protection and canal stages to the east without limiting water availability to water users and Biscayne Bay. Therefore, additional analysis of the CEPP seepage cutoff wall would be conducted during PED.

The specific feature locations of the authorized CEPP plan are shown in **Figure 1-4**.

1.3 PURPOSE AND NEED FOR THE POST-AUTHORIZATION CHANGE TO THE CENTRAL EVERGLADES PLANNING PROJECT

Despite the progress toward CERP goals that will result from implementation of the authorized CEPP plan, ecological conditions and functions within the Northern Estuaries and central portion of the Everglades ridge and slough community require additional infrastructure to achieve what CERP identified. Ecological conditions and functions in estuaries on the east and west coasts of Florida will continue to experience adverse impacts due to excessive damaging regulatory releases from Lake Okeechobee during wet years. The goal of the CEPP PACR is to develop a plan to provide sufficient conveyance, water storage, and treatment capacity south of Lake Okeechobee in the EAA to further reduce damaging discharges to the Northern Estuaries and deliver additional flow to the Greater Everglades consistent with the CERP goals.

During and since congressional authorization of CEPP in 2016, the State of Florida has experienced excessive rainfall well above average resulting in significant releases from Lake Okeechobee to the Northern Estuaries that caused ecological damage and impacts to the economy. As a result of these damaging discharges to our Nation's unique and diverse estuaries and the economy, Florida Governor Rick Scott declared a state of emergency under Executive Orders (E.O.) 16-59, 16-155, and 16-156.

Immediately following the Governor's Executive Orders and recognizing that CEPP provided the first increment of storage and treatment to redirect a portion of the damaging discharges from the Northern Estuaries to the central portion of the Everglades, the Florida State Legislature passed the Water Resources Law of 2017 (Laws of Florida, Chapter 2017-10, Senate Bill 10). The law, signed by the Governor in May 2017, directed the SFWMD to pursue an expedited process to reduce the damaging discharges by providing for increased storage, treatment capacity and conveyance in the EAA jointly with the USACE and consistent with the CERP.

Extreme rainfall over the 2017 wet-season resulted in historically large and long duration releases to the Northern Estuaries. **Figure 1-5** illustrates the excessive rainfall amounts that occurred in back-to-back months of June/July and September/October. The rainfall experienced in June, September, and October was approximately 190% greater than the average rainfall expected for these months due in large part from Tropical Storm Philippe and Hurricane Irma. These storms resulted in high Lake Okeechobee stages (see **Figure 1-6**) and necessitated undesirable regulatory releases to both the St. Lucie and Caloosahatchee Estuaries.

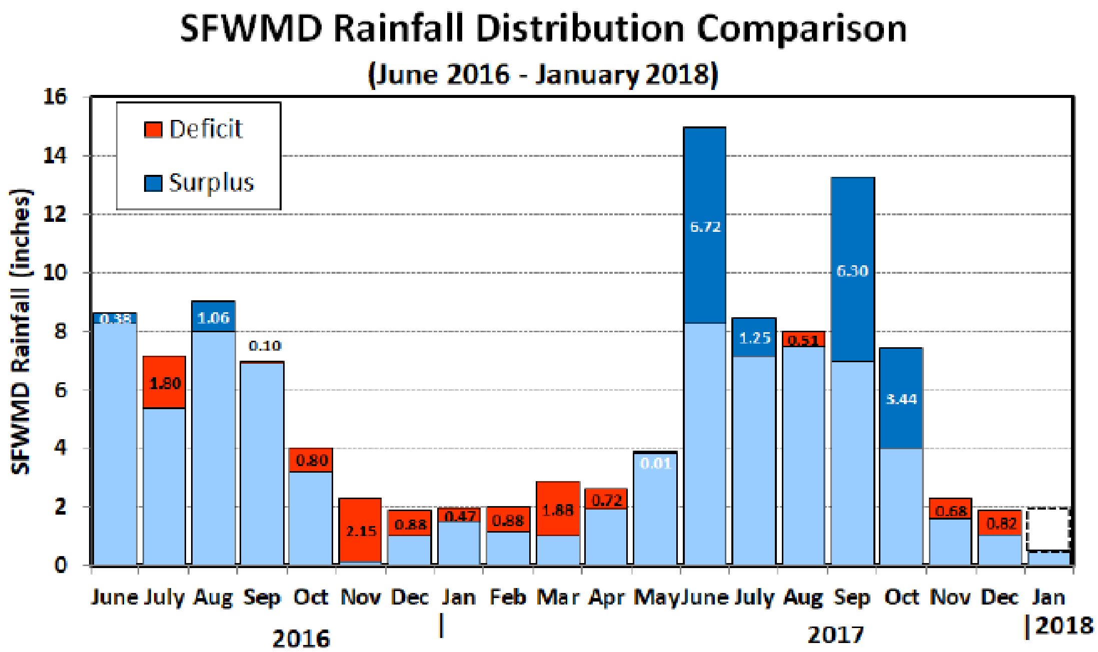


Figure 1-5. SFWMD Rainfall Distribution Comparison by Month (June 2016-January 2018)

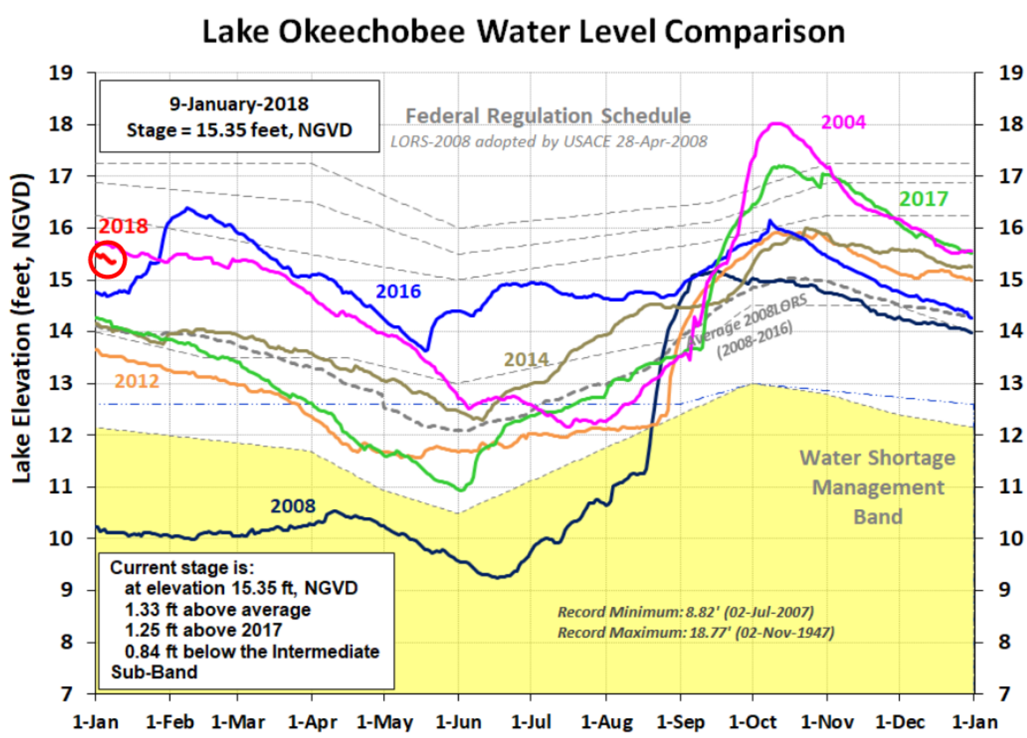


Figure 1-6. Lake Okeechobee Water Level Comparison for January 9, 2018

The damaging discharges from Lake Okeechobee had a significant impact on the ecology of the Northern Estuaries. Submerged aquatic vegetation (SAV), which collectively includes seagrass and macroalgae, and oyster beds, are the most important resources in the Northern Estuaries (IRL CCMP 1996). Impacts from recent extreme events, the wet summers of 2013 and 2016 and especially Hurricane Irma in 2017, created a particularly damaging scenario. Oysters that occur in the more upstream locations in the estuaries have been wiped out by these same events. In a more natural pre-drainage condition, the estuaries also experienced extreme events such as El Niño “wet” dry seasons and hurricanes, but the frequency and severity of the large freshwater releases into the estuaries would have been much reduced in both magnitude, duration, and frequency. Currently even in non-hurricane years, a wet summer can produce damaging discharges. When this occurs in most years, as it does currently, the resilience of these systems is reduced, making them very vulnerable to ecological collapse. See **Appendix C.1** for more details.

Damaging discharges from Lake Okeechobee also had significant impacts to the economy (see **Section 6.2.3**). Significant economic losses in commercial fishing, recreation, tourism and the real estate sectors are all heavily impacted by damaging Lake Okeechobee discharges to the Northern Estuaries.

Screening efforts conducted and described in the CEPP PIR (CEPP PIR 2015, Section 3.2.1.5) eliminated a 12-foot deep reservoir configuration due to excessive cost and low economic efficiency. The CEPP PIR estimated a nearly $2 billion cost for a 21,000-acre reservoir and 7,000-acre STA capable of delivering an average annual flow of approximately 240,000 ac-ft to the central Everglades. While the CEPP plan formulation process resulted in the deep reservoir component being screened out, it should be noted that based on scoring for all storage and treatment criteria, this alternative performed better for the Northern Estuaries and the greater Everglades than all other alternatives considered (see CEPP PIR, Appendix E).

While CEPP was able to make substantial gains in reducing harmful discharge events, it was not successful in capturing many of the larger and longer duration estuary events. The CEPP alternatives reduce the moderately high lake inflow and estuary discharge events while the CEPP PACR can manage the extremely high and longer duration lake inflows by diverting larger flows to the south, to the storage and treatment facilities, and reducing flows that would have otherwise gone to the estuaries.

Section 6.9.9 of the CEPP PIR (2014) specifically states the following in regard to the inclusion of the A-2 FEB within the EAA in the CEPP plan in lieu of a deeper storage reservoir:

> *The A-2 FEB does not preclude future increments of CERP planning for additional storage in the EAA to provide additional water supply deliveries for either agricultural irrigation or environmental water deliveries. For example, the A-2 FEB could be converted to an STA or deeper reservoir and STA that works in conjunction with the State’s existing STA system to accommodate any future upstream storage to further increase water deliveries to the WCAs, and/or the CERP EAA – Phase I storage functions could be implemented. CEPP is not seeking the deauthorization of the CERP EAA Reservoir Phase I, recognizing that improvements in water supply for the LOSA (Lake Okeechobee Service Area) will need to be considered in future increments of CERP that provide additional storage for capturing water currently being sent to tide from Lake Okeechobee or capturing water from other sources. Future CERP increments that provide this additional storage will increase water made available in the regional system for other water related needs.*

Florida Law Chapter 2017-10 directs the expedited planning, design, and construction of improved conveyance, water storage and treatment in the EAA to reduce high-volume discharges to the Northern Estuaries and redirect flow to the Greater Everglades. The law directs the SFWMD to meet certain expedited timelines for implementing the project by preparing a PACR to the authorized CEPP Plan.

The currently authorized CEPP plan would store, treat, and redirect approximately 210,000 ac-ft of additional water on an average annual basis to the historical Everglades ecosystem in lieu of releasing the excess water from Lake Okeechobee through the St. Lucie Canal (east) and the Caloosahatchee Canal (west) to the coastal estuaries (referred to as the Northern Estuaries). The improvements included in the authorized CEPP plan delivers approximately two-thirds of the CERP goal to the central portion of the Everglades system. The CEPP PACR provides the additional storage and treatment to further mitigate damaging discharges from Lake Okeechobee and deliver the remaining one-third of new water essential to Everglades restoration consistent with the CERP performance goal.

The SFWMD initiated discussions with the USACE Jacksonville District in the summer of 2017 about options for an expedited study to address the need for additional water storage and treatment capacity in the EAA south of Lake Okeechobee. After evaluating all available options, the SFWMD (as the non-Federal sponsor for CERP) elected to prepare an Integrated FS/DEIS document that is consistent with NEPA to serve as a PACR for the Federally authorized CEPP plan. The FS/DEIS document (i.e., PACR) has been prepared for submittal to the ASA(CW) for review, approval, and transmittal to Congress for authorization under authority granted by Section 203 of WRDA 1986, as amended. Pursuant to amendments to Section 203 of WRDA 1986 contained in section 1126 of the WIIN Act of 2016, the SFWMD and USACE signed a Memorandum of Agreement whereby the USACE Jacksonville District has provided limited coordination and technical input to the SFWMD in support of preparation of this CEPP PACR.

The CEPP PACR has been developed in accordance with the USACE planning process for water resources projects. The USACE is authorized to carry out civil works water resources projects for navigation, flood damage reduction, ecosystem restoration, storm damage prevention, hydroelectric power, recreation, and water supply. Planning for these water resource projects is based on the *Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies* adopted by the U.S. Water Resources Council (1983). The USACE follows a six-step planning process defined in the Principles and Guidelines: (1) identify problems and opportunities, (2) inventory and forecast conditions, (3) formulate alternative plans, (4) evaluate alternative plans, (5) compare alternative plans, and (6) select a plan. Civil works studies are to be developed in compliance with State and Federal laws. NEPA requires the USACE to comply with a process that can include the inventory and assessment of the environmental resources within the study area (Engineering Regulation [ER] 1105-2-100).

1.4 SCOPE OF STUDY

The authorized CEPP is composed of increments of project components that were identified in the CERP, reducing the risks and uncertainties associated with project planning and implementation. The term "increment" is used to underscore that CEPP formulated portions (scales) of individual components of the CERP. It was envisioned that later studies would investigate additional scales of components of the CERP to expand upon this initial "increment" to achieve the level of restoration envisioned for the CERP. This approach is consistent with the recommendations of the National Research Council to utilize Incremental

Adaptive Restoration to achieve timely, meaningful benefits of the CERP and to lessen the continuing decline of the Everglades ecosystem.

The CEPP study recommends increments of the following components that were included in CERP (the Component designations below are consistent with the CERP designations in the Yellow Book):

- Everglades Agricultural Storage Reservoirs (Component G)
- WCA 3 Decompartmentalization and Sheetflow Enhancement (Components AA and QQ)
- S-356 Pump Station Modifications (Component FF)
- L-31 N Improvements for Seepage Management (Component V)
- System-wide Operational Changes – Everglades Rain-Driven Operations (Component H)
- Flow to Northwest and Central WCA 3A (Component II)

As authorized, execution of CEPP is expected to deliver approximately 210,000 ac-ft of flow on an average annual basis to the central portion of the Everglades that otherwise would be undesirably discharged to the Northern Estuaries, thus improving ecosystem conditions in the central Everglades and Northern Estuaries.

The scope of the CEPP PACR focuses on the final increments of four specific components of the CERP (the assigned letter refers to its CERP designation):

- Everglades Agricultural Storage Reservoirs (Component G)
- Flow to Northwest and Central WCA 3A (Component II)
- Environmental Water Supply Deliveries to the St. Lucie Estuary (Component C)
- Environmental Water Supply Deliveries to the Caloosahatchee Estuary (Component E)

The CEPP PACR also includes consideration of updated System-wide Operational Changes – Everglades Rain-Driven Operations (Component H).

The objective of the CEPP PACR is to develop a plan to further reduce the damaging discharges from Lake Okeechobee to the Northern Estuaries and redirect flow south to meet the CERP flow goal to the central Everglades.

1.5 STUDY AREA

The study area for the CEPP PACR is the same area used for the authorized CEPP: the Northern Estuaries (St. Lucie River and Indian River Lagoon and the Caloosahatchee River and Estuary), Lake Okeechobee, the EAA, the Water Conservation Areas (specifically WCAs 2 and 3), ENP, the Southern Estuaries (specifically focused on Florida Bay), and portions of the Lower East Coast (LEC) (See **Figure 1-7** and **Table 1-1**). Adjacent areas were also evaluated. For purposes of this study, the term Greater Everglades is defined as the region encompassing WCA 3 and ENP.

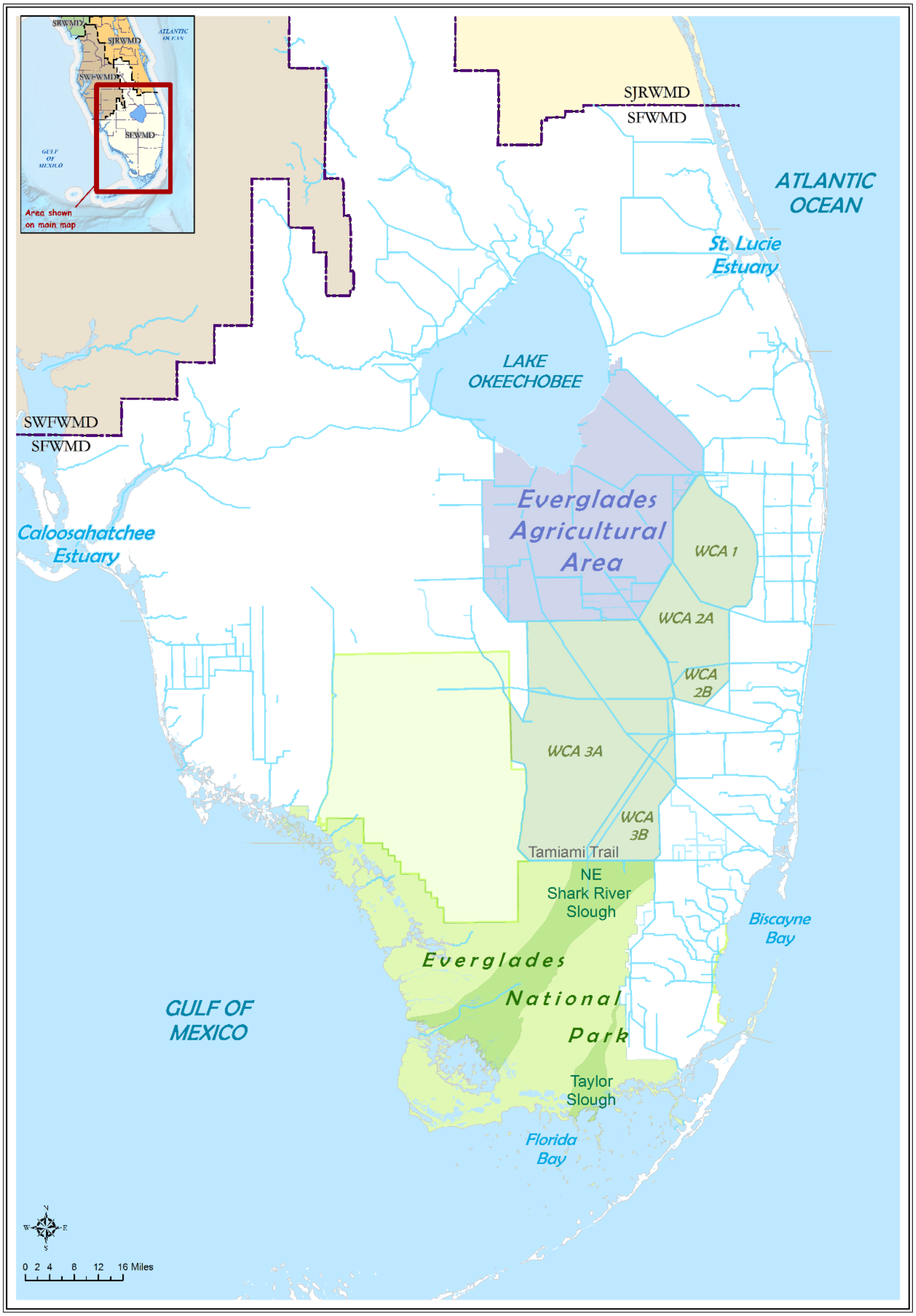


Figure 1-7. CEPP PACR Study Area

Table 1-1. Description of the CEPP PACR Study Area / Region of Influence

CEPP PACR Study Area Region	Description of the Study Area Region
Lake Okeechobee	Lake Okeechobee is a large, shallow lake (surface area 730 square miles) 30 miles west of the Atlantic coast and 60 miles east of the Gulf of Mexico. It is impounded by a system of levees, with 6 outlets: St. Lucie Canal eastward to the Atlantic Ocean, Caloosahatchee Canal/River westward to the Gulf of Mexico, and four agricultural canals (West Palm Beach, Hillsboro, North New River, and Miami). The lake is surrounded by the 143-mile-long Herbert Hoover Dike. The lake has many functions, including flood risk management, urban and agricultural water supply, navigation, recreation, fisheries, and wildlife habitat. It is critical for flood control during wet seasons and water supply during dry seasons. Agriculture in the Lake Okeechobee Service Area (LOSA), including the Everglades Agricultural Area (EAA), is the predominate user of lake water. The lake is an economic driver for both the surrounding areas and south Florida's economy.
Northern Estuaries	Lake Okeechobee discharges into the two Northern Estuaries. The St. Lucie Canal flows eastward into the St. Lucie Estuary, which is part of the larger Indian River Lagoon Estuary. The Caloosahatchee Canal/River flows westward into the Caloosahatchee Estuary and San Carlos Bay, which are part of the larger Charlotte Harbor Estuary. The St. Lucie and Caloosahatchee estuaries are designated Estuaries of National Significance, and the larger Indian River Lagoon and Charlotte Harbor estuaries are part of the U.S. Environmental Protection Agency (USEPA)-sponsored National Estuary Program. The landscape includes pine-flatwoods, wetlands, mangrove forests, submerged aquatic vegetation, estuarine benthic areas (mud and sand), and near-shore reefs.
Everglades Agricultural Area	The EAA is approximately 450,000 acres in size and is immediately south of Lake Okeechobee. Much of this rich, fertile land is devoted to sugarcane production, and is crossed by a network of canals that are strictly maintained to manage water supply and flood protection. The landscape includes natural and man-made areas of open water such as canals, ditches, ponds, wetlands, and lands associated with agricultural and urban use. Within the EAA, there is approximately 57,000 acres of stormwater treatment areas (STAs) as well as the Holey Land and Rotenberg Wildlife Management Areas.
Water Conservation Areas (WCA)	WCA 2 and WCA 3 (the largest of the three water conservation areas) are situated southeast of the EAA and are approximately 1,328 square miles. The WCAs extend from EAA to Everglades National Park (ENP). They provide floodwater retention and water supply for urban and agricultural uses, and are the headwaters of ENP. The landscape includes open water sloughs, sawgrass marshes, and tree islands.
Everglades National Park	ENP was established in 1947, covering ~2,353 square miles (total elevation changes of only 6 feet from its northern boundary at Tamiami Trail south to include much of Florida Bay). The landscape includes sawgrass sloughs, tropical hardwood hammocks, mangrove forest, lakes, ponds, and bays.
Florida Bay	Florida Bay is a shallow estuarine system (average depth less than 3 feet) comprising a large portion of the ENP. It is the main receiving water of the Greater Everglades, heavily influenced by changes in timing, distribution, and quantity of freshwater flows into the Southern Estuaries. The landscape includes saline emergent wetlands, seagrass beds, and mangrove forests.

Table 1-1. Description of the CEPP PACR Study Area / Region of Influence (continued)

CEPP PACR Study Area Region	Description of the Study Area Region
Lower East Coast (LEC)	The LEC encompasses Palm Beach, Broward, Monroe, and Miami-Dade Counties. With the exception of Monroe County, water levels in this area are highly controlled by the Central and Southern Florida water management system to provide flood damage reduction and sufficient water supply to minimize the risk of detrimental saltwater intrusion. Biscayne Bay and the contiguous water bodies of Card, Little Card, and Barnes Sounds and Manatee Bay lie along the southeastern mainland boundary of the LEC and receive their freshwater supplies as inflows of surface and groundwater that are dependent on water table stages east of L-31 N. The CEPP PACR is focused on the portions of the LEC adjacent to the natural areas and susceptible to seepage.

For the CEPP PACR, the area of primary focus for the study is a subset of the CEPP study area that includes the Northern Estuaries, Lake Okeechobee, and the EAA, where alternatives to provide for increased storage, treatment, and conveyance capacity between Lake Okeechobee and the proposed project storage and treatment features would be located. However, the region of influence for the physical and ecological effects of increased storage, treatment, and distribution of water in the EAA, as redirected to the central Everglades ecosystem, would extend throughout the entire original CEPP study area. Environmental effects from the execution of the CEPP PACR would be greater than those evaluated in the CEPP. The largest effects would occur in the Northern Estuaries, and areas immediately south of the EAA.

1.6 PROBLEMS AND OPPORTUNITIES

Current operations of the C&SF Project involve water supply and flood releases to manage stage levels in Lake Okeechobee, the WCAs, and the Everglades. Prolonged high-volume discharges of water from Lake Okeechobee to the Northern Estuaries have resulted in damaging effects on the flora and fauna inhabiting these areas. System changes have resulted in point source peak flows that are higher just prior to and/or following major rain events, and flow rates that decline more abruptly during the end of the wet season. Due to limited storage capacity in Lake Okeechobee, flows to the Everglades have shifted from primarily wet season flows in response to rainfall to controlled dry season deliveries in response to urban, Tribal, and agricultural water demands. The impoundment of the natural system, construction of drainage canals and conveyance features, and current C&SF operations have disrupted the annual pattern of rising and falling water depths in the remaining wetlands in the Everglades. These hydrologic changes have contributed to degradation and loss of valuable tree islands. The current system is now too wet in some areas and too dry in others.

Additionally, the conversion of natural areas for urban and agricultural uses and the network of C&SF Project canals have altered the natural system, causing complete shifts in vegetative communities and loss of fish and wildlife resources. The result is reduced water storage capacity in the remaining natural system and an unnatural mosaic of impounded, fragmented, over-inundated, and over-drained marshes.

The CEPP plan that was authorized in the WIIN Act of 2016 was formulated to address a wide array of water resource-related problems and opportunities across the entire CEPP study area. This array of problems and opportunities are described in detail in the CEPP PIR (December 2014). The authorized plan includes structural measures and operations that would address, at least partially, those identified problems and opportunities.

This CEPP PACR would specifically address opportunities to further (1) reduce the quantity, frequency and duration of high-volume regulatory discharges of water from Lake Okeechobee to the Northern Estuaries (via the St. Lucie and Caloosahatchee Canals), and (2) increase water storage and treatment capacity in the EAA such that more water can flow south into the historic Everglades ecosystem beyond the levels envisioned in the authorized CEPP plan. As additional water can be made available for deliveries south into the historic Everglades ecosystem in excess of the approximately 210,000 ac-ft of flow (average annual) expected under the authorized CEPP plan, additional incremental improvements in habitat conditions and ecosystem function in the balance of the CEPP study area would be expected to occur. The incremental improvements in quantity, quality, timing, and distribution of water would further address problems and opportunities identified for specific portions of the CEPP study area as identified in the CEPP PIR, such as the WCAs, ENP, and Florida Bay.

Recreational opportunities remain an important consideration in the CEPP PACR planning process. Tourism is a “critical industry,” as identified by the Governor’s Commission for a Sustainable South Florida (1995) Initial Report. The Everglades is a unique ecosystem in North America and its visitors are the mainstays of the regional economy, as reflected by the relative domination of economic activity in the services, retail trade, and fisheries industries. In addition to tourists, many people visit south Florida regularly to enjoy a variety of outdoor activities, primarily hunting and fishing. The ability to sustain the region’s economy and quality of life depend, to a great extent, on the success of the efforts to protect and better manage the region’s water resources. A stable and healthy ecosystem would directly benefit the local economy through increases in tourism and dollars generated by the residents who enjoy outdoor activities. Additional details are provided in **Section 6.2.3.**

1.7 PURPOSE: OBJECTIVES AND CONSTRAINTS

1.7.1 CERP, CEPP, and CEPP PACR Objectives

Section 601(h) of WRDA 2000 states “[t]he overarching objective of the Plan is the restoration, preservation, and protection of the South Florida Ecosystem while providing for other water-related needs of the region, including water supply and flood protection.” These same objectives applied to the CEPP study efforts and to this CEPP PACR (**Table 1-2**).

Table 1-2. Goals and Objectives of CERP, CEPP, and CEPP PACR

CERP Objective	CEPP Objective	CEPP PACR Objective
CERP Goal: Enhance Ecological Values		
Improve habitat and functional quality	Reduce high-volume discharges from Lake Okeechobee to improve the quality of oyster and SAV habitat in the Northern Estuaries	Further reduce high-volume discharges from Lake Okeechobee to improve the quality of oyster and SAV habitat in the Northern Estuaries
	Restore seasonal hydroperiods and freshwater distribution to support a natural mosaic of wetland and upland habitat in the Everglades System	Further improve upon restoration of seasonal hydroperiods and freshwater distribution to support a natural mosaic of wetland and upland habitat in the Everglades System
	Improve sheetflow patterns and surface water depths and durations in the Everglades system in order to reduce soil subsidence, the frequency of damaging peat fires, the decline of tree islands, and salt water intrusion	Further improve sheetflow patterns and surface water depths and durations in the Everglades system to reduce soil subsidence, the frequency of damaging peat fires, the decline of tree islands, and salt water intrusion
Increase the total spatial extent of natural areas	No corresponding CEPP objective; consider this objective in future increments	No corresponding CEPP PACR objective
Improve native plant and animal species abundance and diversity	Reduce water loss out of the natural system to promote appropriate dry season recession rates for wildlife utilization	No corresponding CEPP PACR objective
	Restore more natural water level responses to rainfall to promote plant and animal diversity and habitat function	Further restore more natural water level responses to rainfall to promote plant and animal diversity and habitat function
CERP Goal: Enhance Economic Values and Social Well-Being		
Increase availability of fresh water (agricultural/municipal & industrial)	Increase availability of water supply	Increase availability of water supply
Reduce flood damages (agricultural/urban)	No corresponding CEPP objective; consider this objective in future increments	No corresponding CEPP PACR objective
Provide recreational and navigation opportunities	Provide recreational opportunities	Provide recreational opportunities
Protect cultural and archeological resources and values	Protect cultural and archeological resources and values	Protect cultural and archeological resources and values

1.7.2 Constraints

Project constraints were recognized to ensure that the proposed project would not reduce the level of service for flood protection, protect existing legal users, and meet applicable State water quality standards for the natural system. When a project is expected to result in an elimination or transfer of an existing legal source of water, the PIR shall include an implementation plan that ensures a new source of water of comparable quantity and quality is available to replace the source that is being transferred or eliminated. Implementation of the project would not reduce the levels of service for flood protection within the areas affected by the project.

In accordance with the Savings Clause provisions of the CERP authorization in WRDA 2000 (Sections 601(h)(4) and (5)) and applicable State and Federal standards, the following constraints were applied to CEPP PACR planning, many of which were included in CEPP planning and implementation:

- Avoid reduction in the existing level of service for flood protection caused by Plan implementation
- Provide replacement sources of water of comparable quantity and quality for existing legal users that could experience water supply reductions caused by Plan implementation
- Meet applicable State water quality standards
- No effect on Tribal Compact
- Land acquisition on a "willing seller" basis

1.8 POST AUTHORIZATION CHANGE REPORT REQUIREMENTS

WRDA 2000 authorized the CERP as a framework for modifications to the C&SF Project in Section 601(b)(1)(A). CEPP was developed and subsequently authorized by Congress in Section 1401(4) of the WIIN Act of 2016, consistent with the WRDA 2000 CERP framework. This integrated feasibility level report and DEIS addresses a proposed post authorization change to the authorized CEPP plan. Consequently, this report has been prepared in accordance with USACE guidance for PACRs as specified in Appendix G of Engineering Regulation (ER) 1105-2-100 (Appendix G, Section G-16.a). **Table 1-3** below identifies the specific information requirements for PACRs and identifies where the applicable information may be found in this report, along with any clarifying notes.

Table 1-3. Required Information for Post Authorization Change Reports (ER 1105-2-100, Appendix G, Section G-16.a)

PACR Topic	PACR Documentation
Description of Authorized Project [Section G-16.a(1)]	A post authorization change is proposed to the authorized Central Everglades Planning Project (CEPP), a component of the Comprehensive Everglades Restoration Plan (CERP). A general overview of CERP is included in **Section 1.1** and a detailed description of the authorized CEPP plan is included in **Section 1.2**.
Authorization [Section G-16.a(2)]	CEPP was authorized by the Water Infrastructure Investments for the Nation (WIIN) Act of 2016. The overall CERP was authorized by Section 601 of the Water Resources Development Act (WRDA) of 2000. The PACR has been prepared by SFWMD under authority granted by Section 203 of WRDA 1986, as amended. See **Section 1.9**.
Funding Since Authorization [Section G-16.a(3)]	Funding since authorization in December 2016 is presented in **Section 6.6.6, Table 6-20**.

Table 1-3. Required Information for Post Authorization Change Reports (ER 1105-2-100, Appendix G, Section G-16.a) (continued)

PACR Topic	PACR Documentation
Changes in Scope of Authorized Project [Section G-16.a(4)]	The PACR addresses a proposed change to authorized CEPP features within the Everglades Agricultural Area (EAA). In lieu of the authorized A-2 Flow Equalization Basin (FEB) feature in the EAA, the PACR includes a Tentatively Selected Plan (TSP) to construct a 240,000 acre-foot A-2 water storage reservoir, stormwater treatment area (STA), and associated conveyance improvements from Lake Okeechobee to the reservoir. The TSP would provide the necessary infrastructure to further decrease regulatory releases from Lake Okeechobee to the Northern Estuaries and to move, store, treat, and distribute additional water to the Greater Everglades ecosystem, resulting in improved environmental benefits system-wide. Refer to **Section 6.1.6** and **Table 6-1** for a comparison of the scope of the PACR TSP to the authorized CEPP features in the EAA relative to specific project elements, real estate requirements, and recreation features. No changes are proposed to other authorized features of the CEPP plan.
Changes in Project Purpose [Section G-16.a(5)]	No change in project purpose is proposed.
Changes in Local Cooperation Requirements [Section G-16.a(6)]	No change in local cooperation requirements is proposed.
Change in Location of Project [Section G-16.a(7)]	The project location for PACR TSP features is the same as the authorized CEPP plan except for the addition of 4,155 acres in the A-2 Expansion area contiguous to the A-2 parcel. The A-2 FEB in the authorized CEPP plan would be located entirely on the A-2 parcel currently in public ownership. Plan formulation for the A-2 Reservoir and A-2 STA in the PACR required consideration of acquiring additional lands contiguous to the A-2 parcel from willing sellers to address options to more cost-effectively accommodate increased water storage and treatment features, consistent with the objectives of the PACR. Increased conveyance features in the North New River Canal and Miami Canal to move additional water from Lake Okeechobee to the proposed A-2 Reservoir can be accomplished within the existing SFWMD right-of-way. **Section 3.1.2** and **Section 6.1.2** describe these proposed project “footprint” modifications in more detail, including the rationale for the proposed change from the authorized CEPP plan.

Table 1-3. Required Information for Post Authorization Change Reports (ER 1105-2-100, Appendix G, Section G-16.a) (continued)

PACR Topic	PACR Documentation
Design Changes [Section G-16.a(8)]	The PACR addresses a proposed change to CEPP features within the EAA. In lieu of the authorized A-2 FEB feature in the EAA, the PACR includes a Tentatively Selected Plan (TSP) to construct a 240,000 acre-foot A-2 water storage reservoir, STA, and associated conveyance improvements from Lake Okeechobee to the reservoir. The TSP would provide the necessary infrastructure to further decrease regulatory releases from Lake Okeechobee to the Northern Estuaries and to move, store, treat, and distribute additional water to the Greater Everglades ecosystem, resulting in improved environmental benefits system-wide. **Table 6-1** in **Section 6.1.1** compares the change in scope and key design parameters and considerations from the authorized CEPP plan to the PACR TSP. **Section 3.5** also provides additional insight on engineering considerations associated with the proposed change from an A-2 FEB feature an A-2 Reservoir and A-2 STA. Pertinent design details for the PACR TSP are provided in **Appendix A**.
Changes in Total Project First Costs [Section G-16.a(9)]	The change in total project first costs reflected in the PACR, compared to the authorized CEPP plan, are entirely attributable to additional first costs associated with construction of a proposed 240,000 ac-ft water storage reservoir, an STA, and conveyance improvements in the North New River Canal and Miami Canal, in lieu of constructing the authorized A-2 FEB in the CEPP plan. The scope of all other CEPP features would remain unchanged from those presented in the CEPP PIR. **Table 6-9** in **Section 6.4** of the PACR presents project first costs for (1) CEPP as authorized by Congress, (2) CEPP updated to current price levels, (3) CEPP as last presented to Congress (4) and the PACR TSP.
Changes in Project Benefits [Section G-16.a(10)]	Changes in the environmental benefits from the authorized CEPP plan to the PACR TSP occur throughout the CEPP planning area. The benefits in the PACR, expressed in habitat units (HU) and other defined metrics, such as the reduction in the duration of high volume freshwater discharges from Lake Okeechobee to the Northern Estuaries, were determined by way of the same methods and models that were used in the CEPP planning process. A summary of the benefits for the PACR TSP and a comparison to those produced by the authorized CEPP plan is presented in **Section 6.2.1**. Specifically, **Table 6-2** summarizes the expected improvement in HU (cumulatively, incrementally, and percent change) across the CEPP planning area as a result of the PACR TSP, **Table 6-3** summarizes the average annual cost per habitat unit for the PACR TSP compared to the authorized CEPP plan, and **Table 6-4** summarizes the further reduction in the duration of high volume freshwater discharges from Lake Okeechobee to the Northern Estuaries for the PACR TSP compared to the CEPP plan.

Table 1-3. Required Information for Post Authorization Change Reports (ER 1105-2-100, Appendix G, Section G-16.a) (continued)

PACR Topic	TSP Documentation
Benefit-Cost Ratio [Section G-16.a(11)]	Ecosystem restoration project justification is based on National Ecosystem Restoration (NER) benefits, expressed in habitat units (HU) and application of cost effectiveness and incremental cost analysis (CE/ICA) methods. Refer to **Table 6-3** in **Section 6.2.1** for summary of (1) the average annual cost per HU for the authorized CEPP plan, (2) the average annual cost per HU for CEPP, as modified by the PACR TSP (cumulative), and (3) the average annual cost per HU for the PACR TSP (incremental change). The benefit-cost ratio for separable recreation features for CEPP, as modified by the TSP, is 2.77, compared to 1.6 for the authorized CEPP plan. Refer to **Table 6-16** in **Section 6.5** for more detail.
Changes in Cost Allocation [Section G-16.a(12)]	No change in cost allocation is proposed.
Changes in Cost Apportionment [Section G-16.a(13)]	No change is proposed in the approach to apportionment of Federal and non-Federal costs for the CEPP plan, as modified by the CEPP PACR TSP. The Federal and non-Federal costs for the PACR TSP would both increase, compared to the CEPP plan, due to the overall cost increase associated with the proposed change to the CEPP plan. **Tables 6-17, 6-18, and 6-19** depict cost sharing for (1) the authorized CEPP plan (2014 price level), (2) the authorized CEPP plan (escalated to 2018 price level), and (3) the PACR TSP (2018 price level), respectively, to enable comparison in Federal and non-Federal costs that will result from the proposed change.
Environmental Considerations in Recommended Changes [Section G-16.a(14)]	The TSP would provide for a substantial increase in environmental benefits to the Northern Estuaries and greater Everglades ecosystem compared to the authorized CEPP features in the EAA and would generally have negligible to minor increases in the adverse environmental effects expected for the authorized CEPP plan. The PACR TSP complies with pertinent environmental laws, regulations, policies, and Executive Orders at the current stage of project planning. The PACR has been prepared in the format of an Integrated Feasibility Study and Draft Environmental Impact Statement (consistent with guidance for studies prepared by non-Federal sponsors pursuant to Section 203 of WRDA 1986, as amended). • **Section 5.1** analyzes and compares the impacts of the alternatives considered in the PACR. Specifically, **Tables 5.1-1 through 5.1-7** compare the impacts of the PACR alternatives to the authorized CEPP plan (identified as the Future Without, or FWO condition) for a full range of resource areas. • **Section 5.2** (including **Tables 5.2-1 through 5.2-7**) provides a direct comparison of the impacts of the PACR TSP to the CEPP plan. • **Section 6.3** summarizes other specific environmental considerations for the PACR TSP, including **Table 6-8**, Cumulative Effects. • **Section 7** presents environmental compliance documentation for the TSP, including a concise summary in **Table 7-2**.

Table 1-3. Required Information for Post Authorization Change Reports (ER 1105-2-100, Appendix G, Section G-16.a) (continued)

PACR Topic	TSP Documentation
Public Involvement [Section G-16.a(15)]	The SFWMD conducted multiple public meetings and web meetings, posted information and notices on the SFWMD web sites, and other forms of public and agency outreach to (1) scope the issues to be addressed in the study and (2) subsequently keep agencies and the interested public informed of study progress. **Section 7.1** of this report provides details on public outreach efforts as well as agency and public input and comments on the process.
History of Project Since Authorization [Section G-16.a(16)]	CEPP was authorized in WIIN 2016, Section 1401(1) (December 2016). USACE is in the early stages of developing Limited Reevaluation Reports (LRRs) addressing features of the authorized CEPP plan. **Sections 1.1 and 1.2** summarize CERP authorization and implementation history, including the CEPP PIR which addresses multiple components of CERP focused on restoration of the central portion of the Everglades ecosystem.

1.9 REPORT AUTHORITY

CEPP was authorized by Congress in the WIIN Act of 2016, consistent with the WRDA 2000 CERP framework. This CEPP PACR has been prepared by the SFWMD for submittal to the ASA(CW) for review, approval, and subsequent transmittal to Congress for authorization under authority granted by Section 203 of the WRDA of 1986, as amended. Consequently, the PACR has been prepared in accordance with USACE guidance contained in ER 1165-2-209 (February 4, 2016) for Section 203 studies of water resources development projects prepared by non-Federal interests. The CEPP PACR has been prepared in the format of an integrated FS and DEIS, which is consistent with the overall approach prescribed by ER 1165-2-209 and addresses all the required elements of the study guidelines presented in Appendix B, Section 2, of the ER.

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2.0 EXISTING AND FUTURE WITHOUT CONDITIONS

This section provides a description of existing and future without (FWO) project conditions within the study area, including a definition of the FWO project condition and how and why it is developed.

2.1 "WITH" AND "WITHOUT" COMPARISONS

The U.S. Water Resources Council's *Economic and Environmental Principles and Guidelines for Water and related Land Resources Implementation Studies* provide the instructions and rules for Federal water resources planning. One *Principles and Guidelines* requirement is to evaluate the effects of alternative plans based on a comparison of the most likely future conditions with and without those plans in place. In order to make this type of comparison, descriptions (often called forecasts) must be developed for two different future conditions: the FWO project condition and the future with project condition. Note that the term "project" used in this context refers to any one of the alternative plans that have been considered in the study. The FWO project condition describes what is forecasted to be in place if none of the study's alternative plans are implemented. The FWO project condition is the same as the alternative of "no action" that is required to be considered by the Federal regulations implementing NEPA. For consistency of the report, the **No Action Alternative** is referred to as the **FWO** for the remainder of this report. The future with project condition describes what is expected to occur as a result of implementing each alternative plan that is considered in the study. The differences between the FWO project condition and the future with project condition constitute the effects of each alternative plan.

2.2 PLANNING HORIZON

The planning horizon encompasses the planning study period, construction period, economic analysis period, and the effective life of the project. The time frame used when forecasting future with and without project conditions while considering impacts of alternative plans is called the period of economic analysis. It may also be referred to as simply the period of analysis. It is the period of time over which subject matter experts think extending the analysis of the plan impacts is important. This time period is frequently confused with the planning horizon, which is a longer and more encompassing concept. **Figure 2-1** shows that the period of analysis is part of the planning horizon.

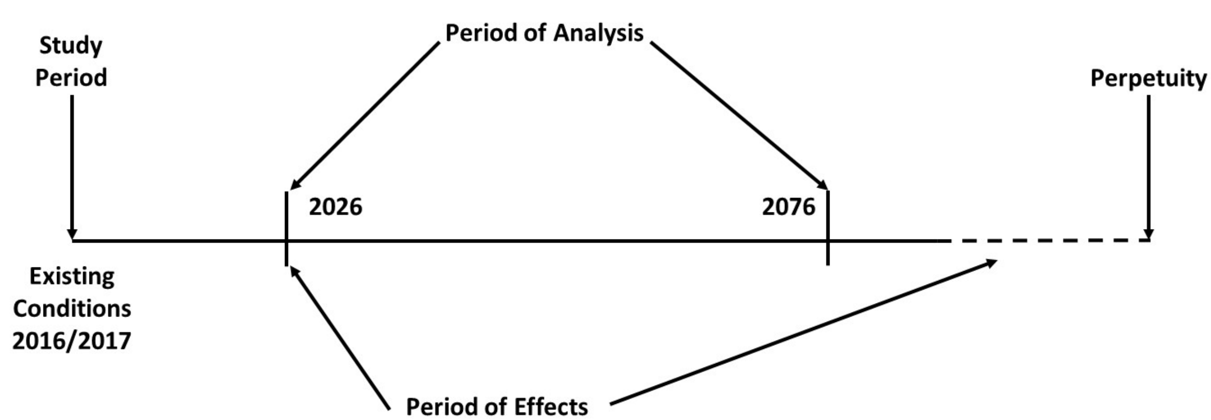

Figure 2-1. Planning Horizon

The period of analysis for water resources projects usually falls between 50 and 100 years. Even if project structures last more than 100 years, there is too much inherent uncertainty to reliably forecast conditions and impacts beyond 100 years. The base year for the period of analysis for the CEPP PACR is 2026. The base year assumes an unconstrained implementation timeline in which the CEPP PACR will be authorized, designed, and constructed. By incorporating a 50-year period of analysis to reflect beneficial and adverse effects of the project through time, the period of analysis for the proposed project will be 50 years, ending in the year 2076.

The typical period of analysis for CERP studies differs from traditional studies because of the programmatic requirement to calculate system-wide benefits. In order to accurately predict system needs and project operations for the entire system, all CERP projects have utilized the same ending date for the period of analysis as the most current version of the plan (e.g., the April 1999 "Final Integrated Feasibility Report and Programmatic Environmental Impact Statement" used 2050).

Accounting for the beneficial and adverse effects of the CEPP PACR through time is largely based on hydrologic modeling and performance measure evaluation. Extending the ending date out to 2076 will not substantially change the outcome of the analysis since future conditions assume that land use and water supply are fixed at existing condition levels. Land use is fixed since development in the CEPP PACR benefit area (natural areas) is prohibited and potential increases to public water supply (PWS) allocations have been capped by State rule which, in general, limits consumptive use withdrawals that induce drawdowns from the Everglades system to actual use as of April 1, 2006. The operations projected in the absence of a project would be similar to 2050 estimates, as would the non-CEPP projects that are being implemented since most of these are expected to be complete well prior to 2050. The latest and best available data were used to project the future conditions, including rainfall patterns. Based on the assumptions used for future forecasting, there is little basis to assume that hydrologic conditions in the study area would be substantially different between 2050 and 2076.

2.3 EXISTING AND FORECASTED ECOLOGICAL DESCRIPTION/SETTING

This section summarizes the existing and FWO project conditions within the study area. Existing and FWO project conditions are further documented in **Appendix C.1**. Lake Okeechobee is the largest lake in the southeastern United States and is a central part of the south Florida watershed. Lake Okeechobee receives water from a 5,400 square mile watershed that includes four distinct tributary systems: Kissimmee River Valley, Lake Istokpoga-Indian Prairie/Harney Pond, Fisheating Creek, and Taylor Creek/Nubbin Slough. With the exception of Fisheating Creek, all major inflows to Lake Okeechobee are controlled by gravity-fed or pump-driven water control structures. Lake Okeechobee provides water supply to urban areas, agriculture, and downstream estuarine ecosystems during the dry season (November-May) and is used for flood control during the wet season (June-October). In the Lake Okeechobee Service Area (LOSA), the Okeechobee Utility Authority is the only remaining PWS utility using water directly from Lake Okeechobee. Clewiston, South Bay, Belle Glade, and Pahokee have discontinued the use of Lake Okeechobee as their supply source and use Floridan aquifer water treated by reverse osmosis for all of their PWS since 2008. The Okeechobee Intercoastal Waterway (OIWW) provides economically and politically important commerce between the eastern and western coasts of Florida. The waterway connects the Atlantic Intracoastal Waterway to the Gulf Intracoastal Waterway and is a congressionally authorized project, with depths and operations required for efficient navigation on the system. The authorized C&SF Project depths for Lake Okeechobee navigation are based on 12.56 ft National Geodetic Vertical Datum (NGVD).

Under pre-drainage conditions, Lake Okeechobee is thought to have been eutrophic (Steinman et al. 2002) and was considerably deeper and larger (spatially) than it is today (Aumen 1995). Outflows from the lake were largely restricted to sheetflow to the south and east. A southern marsh comprised the northern headwater of the Florida Everglades, with the lake often supplying water during periods of high lake levels, including those resulting from high precipitation associated with tropical storms. The historic high and low stages for the lake are estimated at approximately 22.5 ft and 19 ft, respectively (Wright 1911). Historical observations indicate the presence of a substantial sawgrass community located along the western side of the lake, suggesting a historical 8-month hydroperiod for the area during which soils were saturated with water. Historically, stages within the lake may have risen around 2 ft above the marsh ground elevation in the wet season and may have fallen up to 1 ft by the end of the dry season (McVoy et al. 2005).

Currently, Lake Okeechobee differs from the historical lake in size, range of water depth, and connection with other parts of the regional ecosystem. Connecting Lake Okeechobee to the Caloosahatchee River and construction of the St. Lucie Canal in the early 1900s greatly reduced system-wide water storage and sheetflow to the south during drier periods (NRC 2007). Construction of the HHD around the lake reduced the risk of catastrophic flooding of the land immediately adjacent to the lake. It also reduced the size of Lake Okeechobee's open-water zone by nearly 30%, resulting in considerable reductions in average water levels and producing a new littoral zone within the dike that is only a fraction of the size of the natural one (Aumen 1995, Havens and Gawlik 2005). Today, the lake has a surface area of 730 square miles and is extremely shallow. The lake has an average depth of 8.6 ft (average stages 14.12 ft NGVD) based on the period of record from 1972 to 2017. Composition of vegetative communities within the remaining littoral zone of the lake has changed. They remain essential for the ecological health of the lake but are stressed by extreme high and low lake levels and by the spread of non-native species. Lake Okeechobee also receives basin runoff that has excessive nutrient loads primarily from agricultural activities in the watershed (Flaig and Havens 1995, Havens et al. 1996). The sustained influx of nutrients has resulted in dramatic undesirable changes in water quality. In the open-water or pelagic region of the lake, large algal blooms have occurred. These blooms can result in lower dissolved oxygen levels and cause fish kills. Vast quantities of soft organic, nutrient-laden sediments have accumulated which are easily resuspended causing Lake Okeechobee to become turbid. Plants have been impacted and, in turn, those organisms that utilize plant communities as a food source for habitat have been affected.

The St. Lucie River, which is part of the Indian River Lagoon ecosystem, is located on the east coast of Florida. The St. Lucie River is approximately 35 miles long and has two major forks, the North and the South, that flow together and then eastward to the Indian River Lagoon and through the St. Lucie Inlet to the Atlantic Ocean. Historically, the St. Lucie River system was a freshwater stream flowing into the Indian River Lagoon. An inlet between the lagoon and the ocean was dug in the late 1800s to provide direct access from the Indian River Lagoon to the Atlantic Ocean, thus changing the St. Lucie from a river to a tidally influenced estuary. The St. Lucie Estuary is now connected to Lake Okeechobee by the C-44 canal, which was constructed in the early 1900s. The C-44 canal discharges into the St. Lucie Estuary via the S-80 lock and flow control structure. Other major canals constructed in the watershed include the C-23, C-24, and C-25 canals.

The Caloosahatchee River and Estuary is located on the west coast of Florida. The Caloosahatchee River is the major source of freshwater for the Caloosahatchee Estuary. Alterations to the Caloosahatchee River and watershed over the past century have resulted in a major change in freshwater inflow to the estuary. The Caloosahatchee River was originally a shallow, meandering river with headwaters in the proximity of Lake Hicpochee, near Lake Okeechobee. The Caloosahatchee River is now connected to Lake Okeechobee by the C-43 canal constructed in the early 1900s. Today, the river extends from Lake Okeechobee to San Carlos Bay. The river now functions as a primary canal (C-43) that conveys both runoff from the Caloosahatchee watershed and releases from Lake Okeechobee. The canal has undergone numerous alterations including channel enlargement, bank stabilization, and a series of three lock and dam structures. The final downstream structure, W.P. Franklin Lock and Dam (S-79), demarcates the beginning of the estuary and acts as a barrier to salinity and tidal action, which historically extended farther east to near the LaBelle area.

In this document, the estuaries are collectively called the Northern Estuaries. Major modifications to the hydrology of the St. Lucie and Caloosahatchee watersheds through water management, including water releases from Lake Okeechobee along with land-use transformations, increased development, and dredging for navigation, have resulted in changes to the estuaries. Alterations in the quantity, quality, timing, and distribution of fresh water entering the estuary have resulted in adverse ecological impacts in the estuaries. As a result of channelization (C-43 and C-44) and operation of water control structures (S-79 and S-80), freshwater flows into the estuaries tend to be excessive in the wet season and occasionally (St. Lucie Estuary) or chronically (Caloosahatchee Estuary) insufficient in the dry season. The estuaries have lost large acreages of both submerged aquatic vegetation (SAV) and oysters due to large fluctuations in salinity caused by excessive freshwater during wet times and a lack of base flow during extremely dry years. Recolonization is poor, even in areas where salinity conditions are favorable, due to the lack of suitable substrate needed to support benthic fauna and flora. Thick organic mucky sediments especially in the St. Lucie Estuary increase turbidity and deplete oxygen concentrations and eliminate the hard bottom substrate needed for oyster colonization. Septic tanks associated with residential development have also been identified as a source of excess nutrients to the estuary. The natural ability of the estuaries to filter nutrients has also been impacted, contributing to degraded water quality.

Undesirable regulatory releases from Lake Okeechobee occur currently. In 2015 and 2016, undesirable regulatory releases from Lake Okeechobee degraded conditions in the Northern Estuaries, causing adverse environmental impacts that resulted in Florida State Governor Scott issuing emergency management orders (E.O. 16-59 and E.O. 16-204). CEPP assumed these undesirable regulatory releases would be partially offset by future optimization of Lake Okeechobee regulation schedules and risk reduction actions related to HHD combined with possible increases in lake storage. CEPP also assumed local, State, and Federal wetland regulatory programs would likely limit impacts to high-value, estuarine wetlands, and compensatory mitigation would be required to offset any loss of wetland function or value that might occur. Any future effects from local stormwater runoff and resulting eutrophication offset by stormwater facility construction and/or best management practices (BMP) assumed to be offset in CEPP are also assumed in this study.

The remaining portion of the Greater Everglades wetlands includes a mosaic of interconnected freshwater wetlands and estuaries located primarily south of the EAA. A ridge and slough system of patterned, freshwater peat lands extends throughout the WCAs into Shark River Slough in ENP. The ridge and slough wetlands drain into tidal rivers that flow through mangrove estuaries into the Gulf of Mexico. Higher elevation wetlands that flank either side of Shark River Slough are characterized by marl substrates and exposed limestone bedrock. Those wetland areas located to the east of Shark River Slough include the drainage basin for Taylor Slough, which flows through an estuary of dwarf mangrove forests into northeast Florida Bay. The Everglades wetlands merge with the forested wetlands of Big Cypress National Preserve to the west of WCA 3.

Declines in ecological function of the Everglades have been well documented. In the pre-drainage system, the inundation pattern supported an expansive system of freshwater marshes including long hydroperiod sawgrass “ridges” interspersed with open-water “sloughs”, higher elevation marl prairies on either side of Shark River Slough, and forested wetlands in the Big Cypress marsh. Rainfall and seasonal discharge from Lake Okeechobee resulted in overland surface flows (sheetflow) which helped to maintain the microtopography, directionality, and spatial extent of ridges and sloughs. Accretion of peat soils typical of the ridge and slough landscape required prolonged flooding, characterized by 10- to 12-month annual hydroperiods, and groundwater that rarely dropped more than 1 ft below ground surface (Tropical BioIndustries 1990). The depths, distributions, and duration of surface flooding largely determined the vegetation patterns as well as the distribution, abundance, and seasonal movements, and reproductive dynamics of all the aquatic and many of the terrestrial animals in the Everglades (Kushlan and Kushlan 1989, Davis and Ogden 1994, Holling et al. 1994, Walters and Gunderson 1994).

Construction of canals and levees by the C&SF project created artificial impoundments and altered water depth, duration, and distribution throughout the study area. For example, northern WCA 3A has been over drained and its natural hydroperiod shortened while the eastern and southern portion of WCA 3A is primarily affected by high water and prolonged periods of inundation. The result has been substantially altered plant community structures, reduced abundance and diversity of animals and spread of non-native vegetation. The once vast, naturally connected landscape has been cut into a mosaic of various-sized habitat patches. The ridge and slough habitat has become severely degraded in a number of locations and is being replaced with a landscape more uniform in terms of topography and vegetation with less directionality (NRC 2012). The canals adjacent to the project area likely serve as an effective barrier to wildlife movement, interfering with or preventing life functions of many native wildlife species.

The remaining portions of the Everglades are stressed and exhibit levels of reduced aquatic function. The overall negative ecological trends in the remaining portions of the Everglades are expected to continue into the future, with additional loss of resources through landscape alterations and degradation of habitat. The effects of the existing infrastructure and future water management practices will continue to cause dry downs in the natural system. The threat of extreme fires will persist, destroying peat that is necessary for plant growth and water retention. Although less extreme, soil subsidence will also continue as dry downs, particularly during periods of extreme drought, contribute to further soil oxidation. Droughts may increase in frequency and intensity as a result of climate change as well. Unnatural shorter or longer hydroperiods will likely continue to cause harm to remaining tree islands. The overall spatial extent of WCA 3 and ENP is not expected to decline, as these areas are publicly owned and protected from development; however, current problems plaguing the areas are expected to continue and worsen in some areas. Future rates of sea level change are expected to result in significant impacts on coastal canals and communities, with loss of flood protection and increased saltwater intrusion being the primary effects. Coastal ecosystems and estuaries are expected to be adversely affected and require additional deliveries of freshwater to maintain desirable salinity patterns and healthy ecosystems. Climate change also has the potential to change temperature and precipitation in the Everglades.

2.4 COMPARISON OF EXISTING AND FUTURE WITHOUT PROJECT CONDITIONS

Table 2-1 provides a comparison of existing and FWO project conditions. Existing and FWO project conditions are further documented in **Appendix C.1**. Sections within **Appendix C.1** are summarized in **Table 2-1**. The FWO for this CEPP PACR assumes that CEPP, as authorized, has been implemented and is operational.

Table 2-1. Existing Conditions and Future Without (FWO) Project Conditions

Conditions	Existing Conditions	Future Without Project Conditions
Vegetative Communities (Sections C.1.1.1 and C.1.3.1)	Sawgrass prairie, slough vegetation, tree islands, spike rush and beak rush flats, mangroves, freshwater wetlands, muhly prairie, cypress stands, native dominated forested wetlands, hydric hammocks, and exotic-dominated forests.	With completion of CERP projects that are already underway and authorized as well as CEPP features completed and operational, hydrologic conditions necessary to sustain and recover vegetative communities in central Everglades and ENP will dramatically improve. Hydrology in WCA 3A, 3B, and ENP would be significantly improved by the implementation of CEPP. Because of changes in the quantity, quality, distribution, and timing of water entering the Greater Everglades ecosystem, beneficial effects on wetland hydrology and vegetation would occur. The delivery of additional flow to the Everglades would return many of the currently dehydrated areas to a level of hydration that moves toward the pre-drainage, natural system condition. Improvements in the volume and distribution of flows to the Greater Everglades would be a step toward restoring natural landscape patterns and native flora and fauna (USACE 2014).
Fish and Wildlife Resources (Sections C.1.1.2 and C.1.3.2)	A great diversity of fish and wildlife species occur throughout south Florida including freshwater and saltwater species. Fish and wildlife resources include aquatic macroinvertebrates, small freshwater marsh fishes, larger predatory sport fishes, amphibians and reptiles, colonial wading birds, and mammals. While these resources are present in the study area, including the Northern Estuaries and central Everglades, conditions suitable to sustain these resources have declined dramatically over the years with population growth and development in south Florida and the associated construction and operation of the C&SF project.	With completion of CERP projects that are already underway and authorized as well as CEPP features completed and operational, hydrologic conditions necessary to sustain and recover the diversity and populations of fish and wildlife species in the Northern Estuaries, central Everglades, ENP, and Southern Estuaries will dramatically improve. Detrimental effects from regulatory discharges to the Northern Estuaries and coastal systems will continue during extreme wet weather events. Aquatic vegetation communities and disruption to aquatic productivity and function will continue to be stressed during high flow regulatory releases. The improved flow conditions to the central Everglades, ENP, and Southern Estuaries resulting from these projects will fall short of established CERP goals because of a continued shortfall of water storage and treatment capacity to the south and north of Lake Okeechobee. Thus, improvements to fish and wildlife resources in the study area will continue to be limited by this constraint.

Table 2-1. Existing Conditions and Future Without (FWO) Project Conditions (continued)

Conditions	Existing Conditions	Future Without Project Conditions
Invasive and Exotic Species (Sections C.1.1.3 and C.1.3.3)	Existing resources indicate 159 species of non-native plants have been documented to occur within the project area; 69 of the plant species are considered invasive or noxious weeds. Existing information indicates 89 non-native animal species have been documented to occur within the project area.	With completion of CERP projects that are already underway and authorized as well as CEPP features completed and operational, flow conditions to the central Everglades, ENP, and Southern Estuaries will reestablish hydrologic conditions that will, in general, promote recovery of native species and help limit the expansion of non-native invasive plant species. Some of these species, however, especially those adapted to aquatic environments, are expected to proliferate as restoration progresses. It is expected that anthropogenic effects would continue to negatively impact the project area. New invasions and the expansion of invasive plant and animal species currently present would continue in the future. Native nuisance species such as cattail would persist in the project area.
Threatened and Endangered Species (Sections C.1.1.4 and C.1.3.4)	A total of 32 Federally protected species occur or have the potential to occur within the project area. Species include but are not limited to the Florida panther, Florida manatee, Everglade snail kite, wood stork, American alligator, American crocodile, and Eastern indigo snake. Designated critical habitat for the American crocodile, Everglade snail kite, West Indian manatee, small tooth sawfish, and Cape Sable seaside sparrow also occurs within the project area. Many State listed species also occur throughout the project study area.	Existing Federal regulations such as the Endangered Species Act, Marine Mammal Protection Act, and Fish and Wildlife Coordination Act, along with similar State regulations, should be sufficient to preserve the continued existence of most endangered plant and animal species in the proposed project area. Given the expected continued decline of the Northern Estuaries there would likely be adverse effects on many threatened and endangered species that live within the coastal areas.
Essential Fish Habitat (Sections C.1.1.5 and C.1.3.5)	The project is located in areas designated as Essential Fish Habitat for corals and live bottom habitat, and is habitat for numerous species of fish and invertebrates. The absence of freshwater flows and/or the release of high level freshwater discharges into estuarine systems and coastal areas currently promote unfavorable conditions.	With completion of CERP projects that are already underway and authorized as well as CEPP features completed and operational, progress in restoring the natural timing, volume, and duration of freshwater flows to the Northern Estuaries would be expected to improve conditions for estuarine and marine systems by reducing excess nutrient loading and providing a more appropriate range of salinity conditions by reducing extreme salinity fluctuations and durations. Redistribution of flow to salt water wetlands and nearshore bay areas would also be expected to result in favorable changes to salinity levels in the Southern Estuaries that would be expected to benefit essential fish habitat (USACE 2014).

Table 2-1. Existing Conditions and Future Without Project (FWO) Conditions (continued)

Conditions	Existing Conditions	Future Without Project Conditions
Climate (including Sea Level Rise) (Sections C.1.1.6 and C.1.3.6)	The project area is characterized by a subtropical climate with distinct wet and dry seasons, high rates of evapotranspiration and floods, droughts, and hurricanes. The climate represents a major physical driving force that sustains the Everglades while creating water supply and flood control issues in the agricultural and urban segments. Of the 53 inches of annual average rain in south Florida, 75% falls during the wet season (May–October). Multi-year high and low rainfall periods often alternate on a time scale approximately on the order of decades. Average annual temperature for the southern Everglades is 76 °F (24 °C).	Climate change is expected to alter rainfall and evapotranspiration patterns over the next 100 years. U.S. Army Corps of Engineers (USACE) sea level change projections for the period from 2015 to 2065 for Key West, Florida, and the broader south Florida area for historic, intermediate, and high rates of future sea level change are +4 inches, +10 inches, and +26 inches, respectively (http://www.corpsclimate.us/ccaceslcurves.cfm). Some examples of sea level change impacts in the future would be continued saltwater intrusion, reduced freshwater supply, retreating shoreline, and habitat transition. Flood damage reduction may also decline as a result of sea level rise. Most coastal flood control structures are gravity driven. Discharge capability of these structures may be reduced. The regional hydrologic models used to simulate with and without project conditions require climatic and tidal data as boundary conditions. Given the uncertainty in future climatic conditions, the historic climate conditions used in the period of record are assumed to represent conditions that are expected to occur in the study area in the future. The model tidal boundary used in the regional hydrologic model was developed using historic tidal data from two primary (Naples and Virginia Key) and five secondary National Oceanic and Atmospheric Administration stations (Flamingo, Everglades, Palm Beach, Delray Beach, and Hollywood Beach). Simulation model tidal boundary conditions that reflect future sea level change were not available for the range of potential sea level rise expected. However, the impact of sea level change on project benefits is assessed for the FWO (see authorized CEPP PIR Annex I) and with project conditions per USACE guidance Engineering Circular 1165-2-212 (see Section 6.0). Note that EC 1165-2-212 was subsequently replaced by ER 1100-2-8162 (December 2013). The sea level rise analysis conducted for the CEPP PIR is not expected to have appreciably changed since the CEPP PIR was prepared. The SFWMD is working with USACE Jacksonville District to update the sea level rise analysis. Some of the ecological benefits associated with CERP projects under construction and future implementation of authorized CEPP features may be reduced or offset by climate change and associated sea level rise effects.

Table 2-1. Existing Conditions and Future Without Project (FWO) Conditions (continued)

Conditions	Existing Conditions	Future Without Project Conditions
Geology and Soils (Sections C.1.1.7 and C.1.3.7)	The regional geology of EAA, WCA 3, and ENP consists of (from youngest to oldest) fill material, undifferentiated sandy, clay materials, and limestone. Recent fill material consists of poorly graded gravel, sand, silt, and minor shell. Layers of peat are embedded within the clay layers. Miami Limestone represents the upper portion of the Biscayne Aquifer. South Florida is underlain by Cenozoic age rocks to a depth of approximately 5,000 ft below land surface with various percentages of sand, limestone, clay, and dolomite. The marl soils are typically characterized as silts with high concentrations of lime. Marl soils form under shallow water conditions and are an important constituent of the whole ecosystem, typically having standing water for short periods of time, and are associated with thick algal mats and periphyton.	Based on current land use indicators, the landscape of south Florida would be developed consistent with County Growth Management Plans and the construction of CEPP, CERP, and non-CERP features would convert prime farmland into wetlands, which may reduce losses of organic soils due to inundated conditions. Hydroperiod performance on WCAs and in the ENP would be expected to improve. Despite restoration efforts some wetland soils located in the EAA could be altered as a result of potential development. Wetland soils would be drained and/or displaced with fill materials to support the urban development.
Municipal and Industrial (M&I) Water Supply/ Demand (Sections C.1.1.11 and C.1.3.11)	Wellfields in the surficial aquifer are the primary source of municipal water supplies and are recharged by surface water, rainfall, and the WCAs. The WCAs maintain groundwater levels and canal stages in the coastal area for purposes of public water supply (PWS), irrigation (i.e., agricultural, industrial, landscape), and maintain a freshwater head along the Lower East Coast (LEC) to slow saltwater intrusion. The SFWMD adopted a restricted allocation area rule for the Everglades and Loxahatchee River water bodies in 2007. The rule, in general, caps consumptive use withdrawals that induce drawdowns from the Everglades system to actual use as of April 1, 2006. The actual demand as of 2016 was 817 million gallons per day (MGD) for PWS from all sources. Like public water supplies, industrial demands dependent on the surficial aquifer system are constrained to usage that does not induce drawdowns from the Everglades system.	In the LEC, groundwater from the surficial aquifer system is the predominant source of water for M&I uses. This trend is expected to continue in the future. Since the Restudy, M&I users' reliance on water from alternative sources such as the Floridan aquifer, reuse, and other sources has grown significantly. Use of these alternative sources to meet a portion (10-15%) of future demands will continue in the future. The LEC projected demands from all sources for PWS is projected to be 1,006 MGD in 2040. Like public water supplies, industrial demands are turning to alternative sources of water rather than the surficial aquifer system. The projected industrial demands in 2040 from the surficial aquifer, including thermoelectric, are 95 MGD.

Table 2-1. Existing Conditions and Future Without Project (FWO) Conditions (continued)

Conditions	Existing Conditions	Future Without Project Conditions
Flood Control (Sections C.1.1.10 and C.1.3.10)	Areas may become flooded during heavy rainfall events due to antecedent conditions that cause saturation and high runoff from developed areas.	Flood protection needs have increased since the original C&SF Project was constructed and will likely continue to increase in the future. As agricultural and urban development continues, the volume, duration, and frequency of floodwaters may increase, and the actual level of flood protection may decline in some areas. Flood protection may also decline as a result of sea level change. Most coastal flood control structures are gravity driven. Discharge capability of these structures may be reduced.
Water Quality (Sections C.1.1.12 and C.1.3.12)	Existing water quality conditions within most of the study area (Lake Okeechobee, coastal estuaries, EAA, WCAs, and ENP) are impaired mostly related to nutrient concentrations. The Florida Department of Environmental Protection (FDEP) is in the process of implementing numeric nutrient criteria. Where water bodies are impaired, FDEP develops total maximum daily load (TMDL) limits. Total phosphorus (TP) concentrations in discharges from Everglades STAs have been the subject of ongoing litigation between State, Federal, and tribal parties. Consent Orders issued to SFWMD by FDEP in 2012 associated with National Pollutant Discharge Elimination System (NPDES) and Everglades Forever Act (EFA) permits require the SFWMD to construct additional water quality improvement projects to assist the existing Everglades STAs in achieving a water quality based effluent limit (WQBEL) for TP. Everglades water quality continues to show improvement. Unimpacted portions of the Everglades WCAs passed all four parts of the State's TP rule as indicated in the most recent five-year TP criterion assessment. The investments made over the last two decades are making a difference improving Everglades water quality with now more than 90% of the Everglades Protection Area at or below 10 parts per billion phosphorus. Additional discussion of TMDLs and water quality is included in **Appendix C.1** and **Annex F**.	Implementation of water quality TMDLs and associated basin management action plans within the Lake Okeechobee and coastal estuaries areas should result in improved water quality conditions. With completion of CERP projects that are already underway and authorized as well as CEPP features completed and operational, the number of low and high salinity events in the Northern Estuaries would be reduced as well as improved nutrient and dissolved oxygen conditions as a result of reduced high flow events from Lake Okeechobee. The SFWMD's Restoration Strategies regional water quality plan will be completed by 2025 and is envisioned to result in compliance with the WQBEL. The authorized CEPP plan includes an A-2 FEB component to maintain WQBEL compliance for existing flows and ensured WQBEL compliance for additional flows from Lake Okeechobee. Maintaining marsh and canal stages through increased flows during the dry season to WCAs and ENP will result in the reduction in dry out events which will reduce peat oxidation/remobilization of nutrients which may improve marsh phosphorus concentrations in the WCAs and inflows to ENP's Shark River Slough. Water quality in urban areas should improve somewhat as stormwater controls are retrofit in areas that undergo redevelopment.

Table 2-1. Existing Conditions and Future Without Project (FWO) Conditions (continued)

Conditions	Existing Conditions	Future Without Project Conditions
Air Quality (Sections C.1.1.14 and C.1.3.13)	Existing air quality in the affected environment is good to moderate. All areas of Florida, except one, are now attainment areas. Orange County, Duval County, the Tampa Bay area including Hillsborough and Pinellas Counties, and Southeast Florida including Miami-Dade, Broward, and Palm Beach Counties continue to be classified by the United States Environmental Protection Agency as attainment/maintenance areas for the pollutant ozone and a portion of Hillsborough County is a non-attainment area for lead.	It is anticipated that increased population and economic expansion in southeast Florida will result in an increase in ozone and other air quality pollutants. Impacts from project related emissions during construction and operations of features in the FWO would not significantly impact air quality within the airshed. New or upgraded pumps would have air quality emissions permits. Because the project is located within a designated attainment area, USEPA's general conformity rule to implement Section 176 (c) of the Clean Air Act does not apply, and a conformity statement should not be required (see USEPA Final Rule on Determining Conformity of General Federal Action to State or Federal Implementation Project (58 Fed Reg. 63213, Nov. 30, 1993)). Over the long-term, rehydration of peat soils in WCA 3A would capture many more tons of C02 than that emitted during construction or as a result of pump operations.
Hazardous, Toxic and Radioactive Waste (HTRW) (Sections C.1.1.15 and C.1.3.14)	Lands potentially used for this project are very likely to have a past or present agricultural land use. Activities conducted over the past 100 years are likely to have resulted in the presence of some HTRW materials on some of this land. State and Federal databases include information on the known HTRW contamination sites. Phase I and II environmental site assessments will be used to identify unknown HTRW sites as well as test cultivated areas for the presence of residual agricultural chemicals.	With completion of CERP projects that are already underway and authorized as well as CEPP features completed and operational, any agricultural lands converted to aquatic habitat or project features will reduce the possibility of future HTRW release on these lands.
Cultural Resources (includes Culturally Significant and Historic Properties) (Sections C.1.1.16 and C.1.3.15)	Several thousand cultural resources exist within south Florida. Due to the existence of known cultural resources within previously surveyed portions of the study area, there is a high probability of unrecorded resources within the project area of potential effect. Further cultural resources investigations will need to be conducted for this project in order to assess effects to significant historic properties. Lands leased to the Miccosukee Tribe of Indians of Florida are experiencing long-term high water staging in the southern part of WCA 3A, which may affect culturally significant sites.	Two significant cultural resource sites (8PB16039 and 8PB16040) will be adversely affected by construction of the A-2 FEB feature of the authorized CEPP plan. Prior to any construction, effects will be analyzed and appropriate mitigation plans developed in consultation with the State Historic Preservation Office and others as appropriate. Cultural resources within ENP will continue to be managed under the Park's established management plan. Cultural resources within WCA 3 and EAA A-2 will continue to be managed by the SFWMD in consultation with the Florida State Bureau of Archaeological Research. Climate change as described in Appendix C.1 will potentially affect cultural resources in the future.

Table 2-1. Existing Conditions and Future Without Project (FWO) Conditions (continued)

Conditions	Existing Conditions	Future Without Project Conditions
Populations (Sections C.1.1.17 and C.1.3.16)	From 1950 to 2000, Florida achieved dynamic change in population. In relation to the remainder of the United States, Florida outgrew the other states by almost 500%. This growth can be attributed to Florida's desirable climate and historically low property costs. With population expansion comes the myriad of challenges related to infrastructure, land use/pattern changes, water demand, environmental impacts, depletion of resources, and health and human safety issues.	It is expected that the study area will continue to grow both in population and in associated infrastructure and commercial development. Both Florida and the region are expected to grow at a rate exceeding the national growth rate, but the growth rate is expected to diminish in the future.
Economy (Sections C.1.1.17 and C.1.3.16)	Employment in the LEC, Martin County, and St. Lucie County shows a greater emphasis on service- or tourism-related industries than in other areas in Florida. These industries in Martin and St. Lucie counties have been negatively affected by recent high-rainfall events and the associated Lake Okeechobee discharges and local runoff. Lee County lost out on an estimated $185 million in tourist spending, and Martin County experienced similar impacts to the tourism and recreation sectors because of poor water quality in 2016.	Future economic growth within the study area is expected to remain consistent with the population growth of the area, while maintaining a mix of service, retail, and administrative jobs. Also to be expected is a shift of income and employment from Miami-Dade County to the surrounding counties of Broward and Palm Beach.
Agriculture (Sections C.1.1.18 and C.1.3.17)	Agricultural production is an important sector of the State's economy. Despite continued urban expansion, agriculture throughout south Florida remains a valuable industry and employer. South Florida is a major source of nuts and vegetables, tropical fruits (melons and berries), sugarcane, and other crops.	Agricultural production in the EAA (specifically on the A-2 parcel, which is currently farmed under lease arrangements) will decline slightly with the construction of the A-2 FEB feature of the authorized CEPP plan. Cultivated irrigated agriculture acreage in south Florida is projected to remain relatively stable, and not projected to change significantly. Other field crops, sod, and greenhouse/nursery are expected to increase slightly over the planning horizon, while other fruits and nuts and vegetables, melons, and berries are expected to fall slightly.

Table 2-1. Existing Conditions and Future Without Project (FWO) Conditions (continued)

Conditions	Existing Conditions	Future Without Project Conditions
Study Area Land Use (Sections C.1.1.18 and C.1.3.17)	The existing use of land within the study area varies widely from agriculture to high-density multi-family and industrial urban uses to natural areas for conservation. A large portion of south Florida remains natural, although much of it is disturbed land.	Urban or commercial development should occur within major urban service areas located within the project area. Agriculture is expected to remain a strong economic force, yet conceding some ground to urban development and restoration efforts.
Recreation (Sections C.1.1.18 and C.1.3.17)	Many areas throughout south Florida are used for recreational activities including hunting, camping, bicycling, hiking, horseback riding, canoeing, boating, swimming, and freshwater and saltwater fishing.	With completion of CERP projects that are already underway and authorized as well as CEPP features completed and operational, reduction in high flow events to the Northern Estuaries would enhance utilization of the estuaries by fish and subsequently improve related recreational opportunities such as fishing and boating. The A-2 site would support nature-based outdoor recreational activities. Improvements to boating access and trail heads throughout the Greater Everglades would provide for increased recreational opportunities.
Noise (Sections C.1.1.21 and C.1.3.19)	Within natural areas, external sources of noise are limited. Existing sources of noise are mainly limited to recreational users including air boats, off road vehicles, swamp buggies, and motor boats. Existing sources of noise outside of the rural communities are limited to vehicular traffic, agricultural vehicles, etc. Within urban areas, existing sources of noise include noise associated with transportation arteries, operations of construction and landscaping equipment, and operations at commercial and industrial facilities.	Sources of noise associated with surrounding land use are expected to be similar to those described in existing conditions. Noise impacts will change in areas where land use is projected to change from agriculture to residential/commercial. Within rural municipalities and urban areas, sound levels would be expected to be of greater intensity, frequency, and duration as areas are further developed from agricultural to residential/commercial due to increased noise from traffic, construction associated with development, and increased operations at commercial and industrial facilities.
Aesthetics (Sections C.1.1.22 and C.1.3.20)	Natural areas within south Florida are comprised of a variety of wetlands, sawgrass marshes, wet prairies, and tree islands. The land is very flat, with slight topographic rises on some tree islands. Much of the visible topographic features are a result of human development, such as canals and levees. Views of much of the area offer pleasant perspectives of the Everglades and tree islands.	Visual and aesthetic resources in south Florida, along Lake Okeechobee's southern shore, south of Lake Harbor and South Bay, and in and around the A-1 and A-2 FEBs would be permanently changed in areas adjacent to the Miami Canal and North New River Canal. With CEPP, there would be an incremental increase in man-made visible features such as canals, levees, and associated infrastructure in these areas. There will be future development near natural areas in south Florida. Increased occurrence of visible features such as roads, highways, single-family homes, high rises, and commercial and industrial facilities may detract from the regional aesthetic.

2.5 STRUCTURAL AND OPERATIONAL ASSUMPTIONS IN THE FUTURE WITHOUT PROJECT CONDITION

The FWO project condition for the CEPP PACR assumes the construction and implementation of authorized CERP, including CEPP, and non-CERP projects, and other Federal, State, or local projects constructed or approved under existing governmental authorities that occur in the CEPP study area. Construction has begun on the first generation of CERP projects already authorized by Congress. These include the Indian River Lagoon-South (IRL-S) Project, the Picayune Strand Restoration Project, and the Site 1 Impoundment Project. Construction has also begun on the second generation of CERP projects already authorized by Congress. These CERP projects, authorized in the Water Resources Reform and Development Act (WRRDA) of 2014, include the Biscayne Bay Coastal Wetlands (BBCW) Phase I Project, Broward County Water Preserve Areas (WPA) Project, the Caloosahatchee River (C-43) West Basin Storage Reservoir, and the C-111 Spreader Canal Western Project. The first generation and second generation of authorized CERP projects listed here were previously referenced as the CERP “Band 1” Projects in the CERP Master Implementation Sequencing Plan (MISP), with the “Band 1” list also originally including the Acme Basin B, Loxahatchee River Watershed, and the EAA Storage Reservoir (Part 1) CERP projects. The EAA Storage Reservoir (Part 1) project is now known as the A-1 FEB constructed as part of the State’s Restoration Strategies Program.

The CEPP was authorized in Section 1401(4) of the WIIN Act of 2016. As a congressionally authorized project, the CEPP is assumed to be constructed and in operation in the FWO project condition for the CEPP PACR. The authorized CEPP is described in **Section 1.2**. The CEPP will increase freshwater flows to the central portion of the Everglades and ultimately Florida Bay by diverting approximately 210,000 ac-ft per year on an average annual basis, which will restore about two-thirds of the additional flow identified in CERP, and thereby improve habitat conditions and ecological function in the St. Lucie Estuary, Caloosahatchee Estuary, WCA 3, ENP, and Florida Bay.

Non-CERP projects included within the FWO project condition consist of the SFWMD Restoration Strategies, C&SF Canal-51 West End Flood Control Project, the C-111 South Dade Project, the Kissimmee River Restoration Project, Modified Water Deliveries (MWD) to ENP Project, and the Department of Interior (DOI) Tamiami Trail Modifications Next Steps (TTNS) Project.

The FWO specifically does not include the ongoing CERP study known as the Lake Okeechobee Watershed Restoration Project (LOWRP). LOWRP is in the planning phase, scheduled for completion in 2019, and not yet authorized by Congress. The LOWRP will capture, store, and redistribute water entering the northern part of Lake Okeechobee to improve lake water levels for both environmental restoration and water supply purposes, reduce high level discharges to the St. Lucie and Caloosahatchee Estuaries, restore wetland habitats, and reestablish connections among natural areas that have become hydrologically fragmented. While not included in the FWO project condition, LOWRP will have a positive cumulative effect on the authorized projects. This CEPP PACR recognizes the important relationship of the LOWRP relative to project benefits, Savings Clause conditions, and project assurances requirements with and without the LOWRP. Consequently, **Section 6** of this report (Tentatively Selected Plan) includes a specific discussion addressing the relationship, synergies, interdependencies, and project sequencing requirements of CERP storage north and south of Lake Okeechobee relative to the ongoing LOWRP.

Table 2-2 summarizes the status of non-CERP projects, CERP projects, and operational plans assumed to differ between the existing conditions baseline (ECB) and FWO. Project features listed in **Table 2-2** were represented in the hydrologic model simulation of the ECB and FWO project conditions. The FWO project condition assumptions, which were established early in the CEPP PACR plan formulation process, provided a consistent set of conditions for detailed alternative evaluation purposes. These conditions also represent the most current information for the analysis of Savings Clause requirements and project-specific assurances in **Annex B**.

Table 2-2. Status of Non-CERP Projects, CERP Projects, and Operations Plan for Existing and Future Without Project Conditions

Category	Existing Condition	Future Without Project Condition
Status of Non-CERP Projects	Modified Water Deliveries (MWD) to ENP Project features, including the S-355A and S-355B gated spillways, 4-mile degrade of L-67 Extension Levee, 8.5 Square Mile Area Flood Mitigation Project have been constructed and are operational.	Construction completed and features operated: C-111 South Dade (Contracts 8 and 9); C&SF C-51 West End Flood Control Project; Kissimmee River Restoration; SFWMD Restoration Strategies (Central Flow Path features); DOI Tamiami Trail Modifications Next Steps Project (5.5 miles of additional bridges); Seepage Barrier Near the L-31 N Levee (Miami-Dade Limestone Products Association); MWD Project features including existing condition components plus Tamiami Trail Modifications (1-mile eastern bridge) are constructed. However, no operational changes for the L-29 Canal stage, G-3273 constraint, or the S-356 pump station were represented in the FWO project condition.
Status of CERP Projects	No completed projects. Construction in progress.	Construction completed and features operated: IRL-S Project; Picayune Strand Restoration Project; Site 1 Phase 1 Project; BBCW Phase I Project; Broward County WPA Project; Caloosahatchee River (C-43) West Basin Storage Reservoir; C-111 Spreader Canal Western Project; Central Everglades Planning Project
Operations Plan for WCA 3A, ENP and the SDCS	ERTP (2012); L-29 Canal maximum operational stage limit: 7.5 ft NGVD; G-3273 constraint: 6.8 ft NGVD	ERTP (2012) with CEPP operations, including Rainfall Driven Operations; L-29 Canal maximum operational stage limit: 9.7 ft NGVD; G-3273 constraint: 9.5 ft NGVD.
Operational Plan for Lake Okeechobee	2008 LORS	2008 LORS with CEPP Operations.

2.5.1 Lake Okeechobee Operations

The 2008 LORS was identified as an interim schedule in April 2008 when it was approved. USACE expects to operate under the 2008 LORS until there is a need for revisions due to the earlier of either of the following actions: (1) system-wide operating plan updates to accommodate CERP projects, or (2) completion of sufficient HHD remediation and associated culvert improvements, as determined necessary to lower the Dam Safety Action Classification (DSAC) rating from Level 1.

The authorized CEPP plan acknowledges that revisions to the current 2008 LORS and Volume 3 of the Master Water Control Manual (Lake Okeechobee and EAA) will be needed to integrate the features of

CEPP as well as the HHD remediation, the Kissimmee River Restoration, and other CERP projects connected or adjacent to Lake Okeechobee. Therefore, it is anticipated that modifications to the 2008 LORS would be triggered by actions other than CEPP implementation. However, depending on the ultimate outcome of these future LORS revisions, including the level of inherent operational flexibility provided with these revisions, CEPP implementation may still require further LORS revisions to optimize system-wide performance and ensure compliance with Savings Clause requirements.

For the CEPP PACR, the ECB assumption for the operation of Lake Okeechobee is the 2008 LORS (USACE 2007). The CEPP PACR FWO project condition assumes 2008 LORS with CEPP operations. Until a new operating schedule is developed under a future study, the FWO project condition is the best estimate for Federally authorized operations.

2.5.2 Herbert Hoover Dike

The 730 square mile Lake Okeechobee is surrounded by the HHD. The HHD was first authorized in 1930 and built by hydraulic dredge and fill methods. HHD has 143 miles of embankment with 5 spillway inlets, 5 spillway outlets, 32 Federal culverts, 9 navigation locks, and 9 pump stations. There are structural integrity concerns with the embankment and internal culvert structures that resulted in a DSAC risk rating of Level 1. DSAC Level 1 represents the highest USACE dam risk of failure rating and requires remedial action. The HHD Dam Safety Modification Study (DSMS) Final Environmental Impact Statement (EIS) (USACE 2016) from 2016 divided the 143-mile dike into 32 segments for analysis. The recommended plan identified in the DSMS provides cost-effective structural measures that work in unison to reduce the likelihood of a breach at HHD. The DSMS recommended plan includes construction of risk reduction measures such as cutoff walls and seepage management systems around the southern half of HHD and limited areas in the northwest sides of the dam. These efforts are intended to lower the DSAC rating from Level 1. The CEPP PACR FWO project condition will assume the planned remediation of HHD will lower the DSAC risk rating and is expected to be completed by 2025.

Prior to the 2008 LORS, Lake Okeechobee operated under the Water Supply and Environmental Regulation Schedule (WSE). The 2006-2008 LORS study was initiated because of adverse environmental impacts that WSE had on the lake ecology. Dike safety was later added as a performance criterion since lowering of the lake, as the LORS study was pursuing, is one of the basic Interim Risk Reduction Measures implemented for deficient dams until appropriate remediation is effectuated. The WSE held Lake Okeechobee stages approximately 1.0–1.5 ft higher than the 2008 LORS under wet conditions. This schedule modification caused adverse impacts to water supply users in the LOSA. Studies for the remediation of HHD are based on the 2008 LORS, which was used as the basis for the development of the Standard Project Flood (SPF) condition. The SPF is the design condition used for the risk assessment and remediation to address internal erosion failure modes.

2.5.3 SFWMD Restoration Strategies Project

The amount of phosphorus historically discharged into the Everglades Protection Area (EPA) has caused adverse ecological impacts in the Everglades. After all corrective actions are complete, by December 2024, discharges from the Everglades STAs will be required to meet a numeric discharge limit for TP concentrations, referred to as a water quality-based effluent limit (WQBEL), which is contained in both the EFA and NPDES permits. The WQBEL was developed to ensure that such discharges do not cause or contribute to exceedances of the 10 parts per billion (ppb) TP criterion (expressed as a long-term geometric mean [LTGM]) established under 62-302.540, Florida Administrative Code (F.A.C.). The TP criterion is measured at a network of stations across the EPA marsh and is intended to prevent imbalances of aquatic flora and fauna. The WQBEL is measured at the discharge points from each STA and requires that the TP concentration in STA discharges shall not exceed: (1) 13 ppb as an annual flow-weighted mean in more than three out of five water years on a rolling basis; and (2) 19 ppb as an annual flow-weighted mean in any water year.

To address water quality concerns associated with existing flows to the EPA, the SFWMD, FDEP, and the United States Environmental Protection Agency (USEPA) engaged in technical discussions starting in 2010. The primary objectives were to establish a WQBEL that would achieve compliance with the State of Florida's numeric phosphorus criterion in the EPA and to identify a suite of additional water quality projects that would contribute to reducing TP concentrations in discharges from the existing Everglades STAs to meet the WQBEL. Based on this collaborative effort, a suite of projects was identified that would achieve the WQBEL. The Restoration Strategies Regional Water Quality Plan (SFWMD 2012) describes those resulting projects and the evaluation tools and assumptions that were utilized in the technical evaluation. The projects have been divided into three flow paths (Eastern, Central, and Western), which are delineated by the source basins that are tributary to the existing Everglades STAs. The identified projects primarily consist of FEBs, STA expansions, and associated infrastructure and conveyance improvements. The primary purpose of FEBs is to attenuate peak stormwater flows prior to delivery to STAs and provide dry season benefits, while the primary purpose of STAs is to utilize biological processes to reduce phosphorus concentrations in order to achieve the WQBEL. The Eastern Flow Path contains STA 1E and STA 1W. The additional water quality projects for this flow path include an FEB in the S-5A Basin with approximately 45,000 ac-ft of storage and an STA expansion of approximately 6,500 acres (5,900 acres of effective treatment area) that will operate in conjunction with STA 1W. The Central Flow Path contains STA 2 and STA 3/4. The additional project is the A-1 FEB with approximately 60,000 ac-ft of storage that will attenuate peak flows to STA 3/4 and STA 2. The Western Flow Path contains STA 5/6. An FEB with approximately 11,000 ac-ft of storage and approximately 800 acres of effective treatment area (via internal improvements) within STA 5/6 is being added to the Western Flow Path. Based on the CEPP PACR project objectives, only the Central Flow Path features were included in the CEPP PACR modeling representation of the FWO project conditions.

2.5.4 Caloosahatchee River (C-43) West Basin Storage Reservoir Project

The Caloosahatchee River (C-43) West Basin Storage Reservoir Project is a CERP project located within Hendry County (USACE 2010). The project was authorized in WRRDA 2014. The purpose of the project is to improve the quantity, timing, and distribution of freshwater flows to the Caloosahatchee River and Estuary. The project provides approximately 170,000 ac-ft of above-ground storage volume in a two-cell reservoir. Major features of the project include external and internal embankments, and environmentally responsible design features to provide fish and wildlife habitat such as littoral areas in the perimeter canal and deep water refugia within the reservoir. The project contributes toward the restoration of ecosystem function in the Caloosahatchee Estuary by maintaining a desirable minimum flow of freshwater to the estuary during the dry season. The project also contributes to a reduction in the number and severity of events where harmful amounts of freshwater from basin runoff and Lake Okeechobee are discharged to the estuary. These two primary functions help to moderate unnatural changes in salinity that are detrimental to estuarine communities.

2.5.5 Indian River Lagoon-South Project

The IRL-S Project is a CERP Project that is located within Martin and St. Lucie counties (USACE 2004a). The purpose of the project is to improve surface-water management in the C-23/C-24, C-25, and C-44 basins for habitat improvement in the St. Lucie River Estuary and southern portions of the Indian River Lagoon. Project features include the construction and operation of four above ground reservoirs to capture water from the C-44, C-23, C-24, and C-25 canals for increased storage (130,000 ac-ft), the construction and operation of four STAs to reduce sediment, phosphorus, and nitrogen to the estuary and lagoon, the restoration of over 90,000 acres of upland and wetland habitat, the redirection of water from the C-23/24 basin to the north fork of the St. Lucie River to attenuate freshwater flows to the estuary, muck removal from the north and south forks of the St. Lucie River and middle estuary. The project is expected to provide significant water-quality improvement benefits to both the St. Lucie River and Estuary and Indian River Lagoon by reducing the load of nutrients, pesticides, and suspended materials from basin runoff.

2.5.6 Operations at Southern WCA 3A, ENP, and the South Dade Conveyance System

The 2006 Interim Operations Plan (IOP) for Protection of the Cape Sable seaside sparrow was the governing regulation schedule for the project area at the start of the CEPP planning process. In addition, existing hydrologic conditions within the project area are a result of IOP operations from 2002 to 2012. Therefore, for planning purposes, the existing condition includes the current approved operational plan for southern WCA 3A, ENP, and the South Dade Conveyance System (SDCS) as of October 2012, known as the Everglades Restoration Transition Plan (ERTP). It superseded the 2006 IOP and is intended to be a transitional plan to be used until completion of the final operational plan for the MWD and C-111 South Dade Projects. The final operational plan for these two projects has not yet been developed. Therefore, for planning purposes, the CEPP PACR FWO project condition includes ERTP (2012) with CEPP operations, including Rainfall-Driven Operations. The ERTP contains an operational constraint at gage G-3273 of 9.5 ft NGVD and a maximum operational stage limit of 9.7 ft NGVD in the L-29 borrow canal upstream and west of the divide structure.

2.5.7 Modified Water Deliveries to Everglades National Park Project

The 1989 Everglades National Park Protection and Expansion Act (Public Law 101-299) directed the Secretary of the Army, in consultation with the Secretary of the Interior, to construct modifications to the C&SF to improve water deliveries to ENP, and, to the extent practicable, take steps to restore the natural hydrological conditions within the Park. Construction of modifications to the C&SF project as authorized in the 1989 Act are justified by the environmental benefits to be derived by the Everglades ecosystem in general and by the Park in particular and shall not require further economic justification.

The goal of the MWD Project is to improve water deliveries into ENP and, to the extent practicable, take steps to restore the natural hydrologic conditions within ENP.

The following MWD features have been constructed or are in progress.

1. Conveyance and Seepage Control Features
    a. Spillway Structure S-355 A and B in the L-29 Levee - complete, operational permit issued to USACE in August 2015;
    b. S-333 and S-334 Modifications - complete;
    c. Tigertail Camp Raising - complete;
    d. Osceola Camp Elevation Evaluation - complete;

   e. S-331 Command and Control - complete;
   f. Pump Station S-356 – complete (temporary pump station), operational permit issued to SFWMD July 2017;
   g. Degradation of 9 miles of the L-67 Extension Canal and Levee - 4 miles complete.

2. Flood Mitigation for 8.5 Square Mile Area
   a. Perimeter Levee - complete;
   b. Seepage Collector Canal - complete;
   c. Pump Station S-357 - complete;
   d. Detention Area – in progress;
   e. Seepage Collection Canal and Structure - complete.
3. Tamiami Trail Modifications
   a. One Mile Bridge Construction - complete;
   b. Road Reconstruction and Resurfacing Construction (to accommodate maximum stages in the L-29 Canal up to 8.5 ft NGVD) - construction complete (December 2013).
4. Project Implementation Support
   a. Monitoring and Mitigation – ongoing;
   b. Technical and Project Management Support – ongoing;
   c. G-3273 Relaxation and S-356 Pump Station Test (the G-3273/S-356 incremental field testing is ongoing.

The 1989 Act requires the project to be constructed *"generally as set forth"* in a General Design Memorandum (GDM), which was completed by the USACE in 1992. Most of the structural features contained in the 1992 GDM and subsequent revisions are complete or under construction and nearing completion. However, some features originally included in the MWD 1992 GDM, including features to provide hydrologic connectivity between WCA 3A and WCA 3B and complete degradation of the L-67 Extension Levee and adjacent canal, have not been completed for various reasons, including operational (water level) constraints within WCA 3B, lowered MWD maximum operational stages for the L-29 Canal (9.7 ft NGVD was assumed with the 1992 GDM), and potential water quality concerns. In March 2012, the ENP Superintendent requested Army concurrence that "remaining unconstructed features" should be deleted and the determination made that the MWD project is complete. The superintendent requested that features needed to accommodate additional restoration flows should be examined under the ongoing CEPP. The USACE continues to work with the DOI on a technical analysis evaluating whether the constructed features and the features currently under construction satisfy the goals of the statute.

Based on the recent completion of the NEPA assessment and subsequent consultation documentation, MWD construction for Tamiami Trail modifications and the 8.5 Square Mile Area seepage collection addition, water levels in the L-29 Canal adjacent to the Tamiami Trail may be raised up to 8.5 ft NGVD on the eastern side of the S-333 structure to integrate the completed MWD features (i.e., the Combined Operating Plan). CEPP includes a significant increase in flow and modified flow-path to ENP to include an additional bridging (2.6 miles) of Tamiami Trail not envisioned as part of the 1992 GDM.

The 1-mile MWD eastern Tamiami Trail bridge and the 2.6-mile CEPP western Tamiami Trail bridge are represented in the Regional Simulation Model for the Glades and Lower East Coast Service Area (RSM-GL) simulation of the FWO condition.

2.5.8 Site 1 Impoundment Project

The Site 1 Impoundment Project will capture and store excess surface water runoff from the Hillsboro watershed and releases from the Arthur R. Marshall Loxahatchee National Wildlife Refuge (LNWR) and Lake Okeechobee (USACE 2006). Located in the Hillsboro Canal Basin in southern Palm Beach County, the project will supplement water deliveries to the Hillsboro Canal by capturing and storing excess water currently discharged to the Intracoastal Waterway. These supplemental deliveries will reduce demands on LNWR. Project features include a 1,660 acre above ground storage reservoir, an inflow pump station, discharge gated culvert, emergency overflow spillway, and a seepage control canal with associated features. Project features will also provide groundwater recharge, help reduce seepage from adjacent natural areas and prevent saltwater intrusion by releasing impounded water back to the Hillsboro Canal when conditions dictate.

2.5.9 Picayune Strand Restoration Project

The Picayune Strand Restoration Project involves the restoration of natural water flow across 85 square miles in western Collier County that were drained in the early 1960s in anticipation of extensive residential development (USACE 2004b). This subsequent development dramatically altered the natural landscape, changing a healthy wetland ecosystem into a distressed environment. The Picayune Strand Restoration Project will restore wetlands in Picayune Strand (Southern Golden Gate Estates) and in adjacent public lands by reducing over-drainage, while restoring a natural and beneficial sheetflow of water to the Ten Thousand Islands National Wildlife Refuge. Project features include plugging 48 miles of canals (with more than 100 plugs to block the flow), 260 miles of road removal, and the addition of pump stations (3) and spreader swales to aid in rehydration of the wetlands. The Picayune Strand Restoration Project is located west of the RSM-GL hydrologic model domain.

2.5.10 Broward County Water Preserve Areas Project

The Broward County WPA Project is a CERP project that is located within the study area of CEPP (USACE 2012a). The project was authorized in WRRDA 2014. Three impoundment areas will be constructed to reduce seepage, provide groundwater recharge, provide water supply to urban areas, and help prevent saltwater intrusion. Pollution load reduction targets necessary to protect water quality within the receiving waters are included in the design. The three project features consist of the WCA 3A/3B Levee Seepage Management system designed to reduce seepage by allowing higher water levels within the L-33 and L-37 borrow canals; the C-11 Impoundment in western Broward County, which will collect direct runoff from the western C-11 drainage basin, thereby reducing the S-9 pumping into WCA 3A and the C-9 Impoundment, located in the western C-9 Basin, designed to store runoff from the C-9 drainage basin and divert water from the western C-11 Basin and aid to reduce seepage. Once constructed, the Broward County WPA will reduce storm water deliveries to WCA 3, thereby increasing the overall quality of water available for delivery to ENP.

2.5.11 Tamiami Trail Modifications: Next Steps Project

The DOI, through the National Park Service (NPS) and ENP, completed a study to evaluate the feasibility of additional Tamiami Trail bridge length, beyond that to be constructed pursuant to the MWD Project to restore more natural water flow to ENP and Florida Bay and for the purpose of restoring habitat within ENP (NPS 2010). This study was authorized by the 2009 Omnibus Appropriations Act passed by Congress on March 10, 2009. The TTNS approved plan called for 5.5 miles of bridging and downstream flow enhancements which would be in addition to the 1-mile bridge authorized by the MWD Project and currently under construction. The remaining unbridged sections of roadway would be elevated to allow a design high water stage of 9.7 ft NGVD in the L-29 borrow canal and to improve distribution of downstream flows. This road height is expected to accommodate the maximum potential range of future stage increases envisioned by CERP without damage to the road. The project was authorized by Congress in the Consolidated Appropriations Act, 2012. The DOI is preparing an implementation strategy. Preliminary indications from the DOI are that the proposed western bridging along Tamiami Trail will be included in the initial DOI implementation increment.

The 1-mile MWD eastern Tamiami Trail bridge and the 2.6-mile CEPP western Tamiami Trail bride are represented in the RSM-GL simulation of the FWO condition. No additional Tamiami Trail bridges, corresponding to the TTNS project features, were represented in the RSM-GL simulation of the CEPP PACR FWO project condition due to uncertainty regarding the implementation sequence and schedule for the TTNS bridges.

2.5.12 Seepage Barrier near the L-31N Levee

As mitigation for a Section 404 permit, the Miami-Dade Limestone Products Association (Association) constructed a 1,000-ft-long, 18-ft-deep slurry wall pilot project to reduce seepage between ENP, the L-31 North Canal and rock mine properties to the east of ENP, just south of Tamiami Trail. Based upon the initial monitoring results, the slurry wall design was revised and the project was reconstructed in 2012 as a 36-ft-deep, 2-mile-long seepage wall. In 2016, the Association completed construction southward of an additional 3 miles of seepage wall, 36 ft deep. However, since the capability of the seepage wall to mitigate seepage losses is under analysis, a 4-mile seepage or slurry wall was represented in the RSM-GL simulation of the FWO project condition to be consistent with the CEPP assumption based on the design planned at that time.

2.5.13 Biscayne Bay Coastal Wetlands Phase I Project

The BBCW Phase I Project is a CERP project authorized in WRRDA 2014. The purpose of the BBCW Phase I Project is to rehydrate wetlands and reduce point source discharge, improve water quality, and provide more natural timing and quantity of water to Biscayne Bay (USACE 2012b). The project would replace lost overland flow and partially compensate for the reduction in groundwater seepage by redistributing available surface water entering the area from regional canals. The BBCW Phase I Project features were not included in the CEPP PACR modeling representation of the FWO project condition since these features along the coast in Miami-Dade County were not considered significant for CEPP plan formulation, and in turn, for plan formulation for the CEPP PACR.

2.5.14 C-111 Spreader Canal Western Project

The C-111 Spreader Canal Western Project is a CERP project within the study area of CEPP (USACE 2009). The project was authorized in WRRDA 2014. It will improve quantity, timing and distribution of water delivered to Florida Bay via Taylor Slough; improve hydroperiods and hydropatterns in the Southern Glades and Model Lands (in southeastern Miami-Dade County adjacent to the eastern boundary of ENP) to restore historical vegetation patterns; and to return coastal salinities to historical concentrations though the redistribution of water currently discharged to the Atlantic Ocean and Gulf of Mexico. These objectives will be realized through the creation of a hydrologic ridge between Taylor Slough and the C-111 Canal, to reduce seepage loss from Taylor Slough and its headwaters. SFWMD has implemented the features of this project. Information gained from the C-111 Spreader Canal Western Project will be used for the planning and design of C-111 Spreader Canal Eastern Project.

2.5.15 C-111 South Dade Project

The C-111 South Dade County 1994 Integrated General Reevaluation Report and EIS was published in May 1994 (USACE 1994). This report described a conceptual plan for five pump stations and levee-bounded retention/detention areas to be built west of the L-31N Canal, between the proposed S-332B and S-332D pump stations, to control seepage out of ENP while providing flood mitigation to agricultural lands east of C-111 Canal. The original and current configuration of these structural features is further discussed in the description of IOP Alternative 7R, within the 2006 IOP Final Supplemental EIS (USACE 2006). Operational guidance for the new S-332DX1 structure was included in the ERTP Final EIS (USACE 2012c).

The C-111 South Dade Project Contract 8/8A has been completed (C-111 North Detention Area) and included in the FWO in **Appendix A, Annex A-2, Section 3 of the Baseline MDR**. However, the FWO project operations of the C-111 South Dade project features are assumed consistent with ERTP since a Combined Operating Plan is under development. The FWO project condition assumes no inflows to the C-111 North Detention Area from the 8.5 Square Mile Area Detention Area, consistent with MWD 2011 8.5 Square Mile Area Interim Operating Criteria.

2.6 NATIVE AMERICANS

Two Federally recognized tribes reside within Florida: the Miccosukee Tribe of Indians of Florida and the Seminole Tribe of Florida. Tribal members living today still recall growing up on tree islands in the Everglades and living as their ancestors did 100 years ago. Tribal members born before big gaming in 1979 recall selling their beadwork or patchwork, wrestling alligators, and dancing for tourists to bring in money to support their families. These people have lived in the heart of the Everglades since the 1830s, well before the first efforts to drain the land began in the 1880s, and have seen first-hand the impact of those efforts on their homes and livelihood (http://www.seminole.com/History/). Refer to the Native American sections in **Section 5** and **Appendix C.1** (**Sections C.1.2** and **C.1.4**) for more information concerning the Tribes.

Today, members of Miccosukee Tribe of Indians of Florida administer four reservations all located within the study area: the Tamiami Trail (Forty-Mile-Bend) Miccosukee Tribe of Indians of Florida's Trail Reservation, the Alligator Alley Miccosukee Reservation, the Krome Avenue Miccosukee Reservation, and the Dade Corners Reservation. The Miccosukee Tribe of Indians of Florida also has a perpetual lease from the State of Florida for nearly 190,000 acres in WCA 3A. The Tribe is authorized to use this land for such purposes as hunting, fishing, trapping, and frogging. Members of the Seminole Tribe of Florida have several reservations in the State of Florida as well as an easement in WCA 3A for such purposes as hunting, fishing and frogging. Of particular note in regard to this report are the Big Cypress, Immokalee, Hollywood, and Coconut Creek reservations as these reservations are all located within the study area.

The Seminole Tribe of Florida has surface water entitlement rights pursuant to the 1987 Water Rights Compact between the Seminole Tribe of Florida, the State of Florida, and the SFWMD (Pub. L. No. 100228, 101 Stat. 1566 and Ch. 87-292 Laws of Florida as Codified in section 285.165, Florida Statues). Additional documents addressing the Water Rights Compact entitlement provisions have since been executed. Two of the Seminole Tribe of Florida's reservation surface water entitlements rely on Lake Okeechobee as a secondary irrigation supply source, with specific volumes of water identified for (1) the Seminole Tribe of

Florida's Big Cypress Reservation and (2) the Brighton Reservation, located northwest of Lake Okeechobee.

Members of both tribes continue to rely upon the Everglades to support their cultural, medicinal, subsistence, and commercial activities. The specific issues impacting each tribe have been different over the last few decades, but they are all related to man-made changes to the Everglades ecosystem. The Miccosukee Tribe of Indians of Florida's focus has been on the detrimental ponding of water on tribal property in WCA 3A, which affects subsistence practices and increases inundation risks to islands utilized by the Tribe. The Miccosukee Tribe of Indians of Florida has also voiced concerns with regards to the impacts of nutrient pollution on the system. The Seminole Tribe of Florida's focus has been on the detrimental drainage of water from the western basin and their Big Cypress Reservation, in addition to the impacts of nutrient pollution on the delicate Everglades system.

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3.0 FORMULATION OF ALTERNATIVE PLANS

3.1 PLAN FORMULATION CONCEPTS

The CEPP PACR incorporates 17 years of updated science, new information, and improved hydrologic modeling tools since authorization of the CERP in 2000. The CEPP, authorized by Congress in 2016, includes increments of CERP. The CEPP PACR further builds on the CEPP with the goal of achieving the level of restoration envisioned by CERP as described in **Section 1.2**. The CEPP PACR plan formulation for the EAA storage reservoir and treatment features applies the most current scientific knowledge and understanding of the Greater Everglades ecosystem, Lake Okeechobee, and the Northern Estuaries, as discussed in more detail in **Section 3.1.2** below. These key attributes affect the formulation strategy for proposed project features addressed in this study.

In addition to reducing damaging discharges to the Northern Estuaries, the CEPP PACR objective is to increase the quantity of water flowing to the central Everglades, which is essential to Everglades Restoration and achieving the CERP goal. The CEPP PIR (page ES-6) stated that CEPP would provide approximately 210,000 ac-ft per year of additional clean freshwater to the central portion of the Everglades, which would be represent about two-thirds of the estimated additional flow anticipated from CERP. Accordingly, the CERP goal would be in the general range of 300,000 ac-ft or greater. More information on this CERP goal is provided in **Section 4.1.1**.

The additional water flowing into the central Everglades and ENP would help to restore vegetative communities and habitat for fish and wildlife while providing additional improvement of natural processes critical for the development of peat soils and tree islands, which are essential features of the Everglades ridge and slough landscape. Additional overland flows would also provide some benefit to salinity in Florida Bay.

The plan formulation process for this study was conducted in accordance with the *Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies* (1983), ER 1105-2-100 (Planning Guidance Notebook), and other pertinent USACE planning guidance. Pertinent provisions of State and Federal law (see **Section 1.0**) and other relevant criteria were also considered. In addition to technical analyses, the planning process also requested and considered stakeholder input to develop alternative plans. Extensive agency and public participation informed the scope of the alternative plans and was considered during the evaluation of each alternative plan. Stakeholder activities for this study are described in detail in **Section 7.1** of this report. This plan formulation process yielded a refined array of alternatives that met the evaluation criteria. Detailed documentation of the evaluation conducted is provided in **Section 4.0** of this report. The basis for the plan formulation concepts includes:

- Incorporating an incremental approach to restoration of the Everglades
- Considering updated scientific knowledge
- Incorporating an alternative development strategy that combines management measures into alternative plans

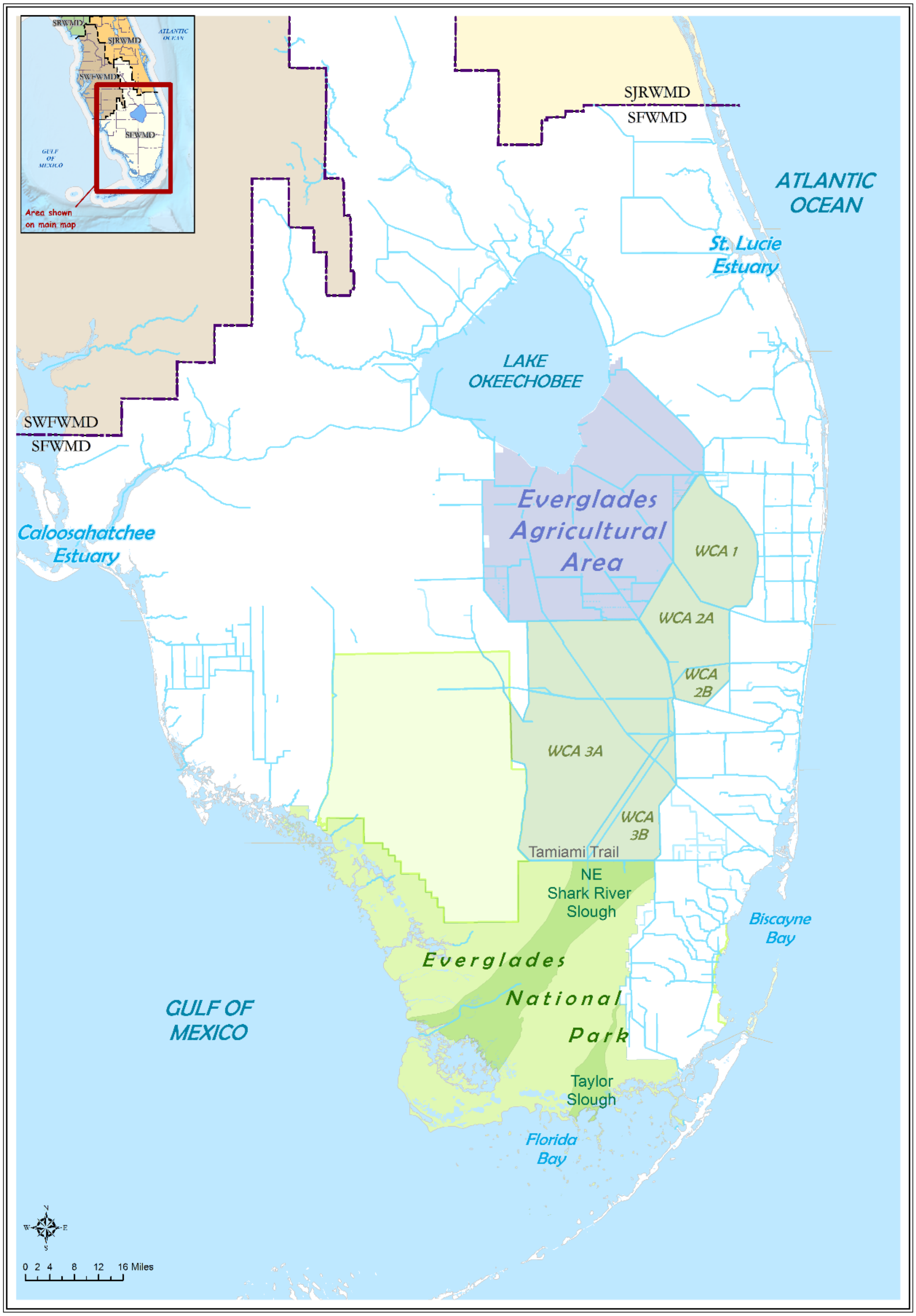

Figure 3-1. CEPP PACR Study Area

3.1.1 Incremental Implementation

It is important to view the incremental implementation of CERP from the perspective of Everglades restoration goals and objectives. This study incorporates the National Research Council (NRC) recommendation that the implementation of CERP projects should provide some immediate restoration benefits while addressing scientific uncertainties. The CEPP PACR study is not a "comprehensive" solution leading to the end state resolution of problems existing in the Everglades ecosystem, but will provide meaningful progress toward restoration of the study area, including achieving the redirection of restoration flows to the natural areas as identified in the CERP and greatly reducing the potential for further degradation. The planning and design of project features will incorporate, to the extent practical, flexibility and robustness to ensure compatibility with future Everglades restoration efforts.

3.1.2 Plan Formulation Strategy

CEPP PACR alternative plan formulation began with screening to identify feasible management measures (structural and non-structural features or activities that address one or more planning objectives). Retained management measures underwent a screening analysis to evaluate, optimize, refine, and group management measures into alternative plans. The screening process is detailed in **Appendix E** and in **Section 3.2.**

The plan formulation process applied during preparation of the CEPP PACR enabled qualitative and quantitative comparisons between the FWO project condition (as described in **Section 2.0**) and the future with project condition. The FWO project condition describes the natural and human environment conditions that are expected to exist in the study area in the future if none of the study's alternative plans are implemented. The FWO project condition for the CEPP PACR assumes the construction and implementation of the specifically authorized CERP projects, including CEPP which was authorized in December 2016; authorized non-CERP projects; and other Federal, State, or local projects constructed or approved under existing governmental authorities that occur in the CEPP PACR study area, as described in **Section 2.0** of this report.

The future with project condition describes the natural and human environment conditions that are expected to exist in the study area in the future with the implementation of each alternative plan that is considered in this study. Based on this formulation and evaluation approach, the CEPP PACR alternative plans were analyzed as the next increment of CERP projects to be added to a system of projects, including authorized CEPP features, identified as likely to have been implemented in the FWO project condition and prior to proposed modifications in this CEPP PACR. The CEPP PACR alternative plans were formulated and evaluated based on the ability of those plans to: (1) contribute to the goals and purposes of the CERP Plan, and (2) provide benefits that justify costs on a next-added increment basis.

The Everglades is a complex ecosystem comprising multiple physical and biological elements whose functions and responses are highly interdependent. The Everglades lies at the center of the complex South Florida regional water management system in which water distributed to any part of the system affects other parts. To achieve incremental restoration of the central Everglades ecosystem, management measures and components cannot be evaluated in isolation, but must be combined and evaluated. The CEPP PACR alternative plan formulation, modeling, and evaluation strategies acknowledge that the storage and conveyance of water, the distribution of water, and seepage management are interacting, interdependent elements that must work together to advance restoration.

The alternative plan formulation strategy for the CEPP PACR included the formulation of interdependent above-ground storage reservoirs, treatment wetlands (aka Stormwater Treatment Areas or STAs), and conveyance improvements south of Lake Okeechobee that would serve to reduce high-volume freshwater discharges from Lake Okeechobee to the Northern Estuaries and redirect the flows to the Greater Everglades, including WCA 3 and ENP. The alternative plan formulation process used data and findings developed in previous and ongoing plan formulation efforts including CERP planning and restoration initiatives, EAA Reservoir Phase I, WCA 3 Decompartmentalization and Sheetflow (Decomp), ENP Seepage Management, CEPP, and the ongoing Lake Okeechobee Watershed Restoration Project (LOWRP) and Western Everglades Restoration Project (WERP) planning studies.

Plan formulation built upon work conducted in the authorized Central and Southern Florida Project Comprehensive Everglades Restoration Plan (Yellow Book), Everglades Agricultural Reservoirs Project Study, and the authorized CEPP, and included a detailed analysis for conveyance, storage and treatment measures in the in the EAA. The Everglades Agricultural Reservoirs (G) in the Comprehensive Everglades Restoration Plan (Yellow Book Alternative) includes above-ground reservoirs with a total storage capacity of approximately 360,000 ac-ft located in the EAA and conveyance capacity increases for the Miami Canal and North New River Canal. The initial design assumed 60,000 acres, divided into three, equally sized compartments (1, 2, and 3) providing 120,000 ac-ft each. The final size, depth, and configuration of this facility in the Restudy was left to be determined through more detailed planning and design.

The Everglades Agricultural Reservoirs Project Study conducted in 2006 evaluated a number of different project alternatives for the conditionally authorized EAA Reservoir Project. The analysis included using varying storage reservoir footprints and depths to obtain the 360,000 ac-ft of above-ground storage in the EAA identified in the CERP. Based upon environmental benefits, environmental effects, engineering, costs, water quality, socioeconomics, and other deciding factors, this study recommended a reservoir impoundment to hold water 12 ft deep on 31,000 acres of publicly owned lands (DOI Talisman A lands) in the EAA.

Consistent with one of the Yellow Book equally sized compartments, the authorized CEPP provides the first increment of CERP storage with the A1 and A2 providing 120,000 ac-ft of above ground storage in the EAA.

Building upon the information identified in the CERP, Everglades Agricultural Reservoirs Project Study, and CEPP, the CEPP PACR evaluated the additional above-ground storage associated with the remaining two Yellow Book equally sized compartments. The CEPP PACR built upon the first compartment of storage (120,000 ac-ft) provided in the authorized CEPP and evaluated alternatives that included the second compartment for a combined total of 240,000 ac-ft and the third compartment for a combined total of 360,000 ac-ft. These evaluations considered environmental benefits, environmental effects, publicly owned land, engineering, costs, water quality, socioeconomics, and other deciding factors including land availability.

The alternative plan formulation was conducted to achieve the next increment of CERP conveyance, storage and treatment south of Lake Okeechobee. Plan formulation allowed for the development and screening of storage reservoirs, treatment wetlands, and conveyance improvements south of Lake Okeechobee and a determination of the effects of the plans in an orderly and systematic manner within the planning boundary and downstream areas. In the Senate Committee Report for WRDA 2000 (Senate Rep. 106-362, July 26, 2000), the Committee directed the USACE to maximize use of the Talisman lands acquired by the SFWMD with Department of Interior funding, as well as other EAA lands held by the non-

Federal sponsor, for the design and construction of the EAA Storage Reservoir. Further, the Committee directed the USACE to take full advantage of the Talisman lands by maximizing the depth of water stored on these lands.

The availability of lands in south Florida was a significant consideration in the formulation of alternatives. The SFWMD, the non-Federal sponsor, took several real estate actions to facilitate planning for the CEPP PACR, which included the pursuit of willing sellers for fee simple acquisition and potential land exchanges. **Appendix D Real Estate** provides more information on this process. The SFWMD's real estate activities were implemented in parallel with planning activities which maximized the use of previously acquired land already in public ownership and adjacent to existing infrastructure to maximize efficiencies in operations. The SFWMD actively pursued the purchase of privately held lands in the EAA. SFWMD expects to acquire parcels from both of the private landowners in A-2 Expansion area between the A-2 parcel and the Miami Canal. Fifteen private landowners, each of whom has an interest in more than 2,500 acres and together represent approximately 80% of the lands within the EAA, provided written notification to the SFWMD that they are not willing to sell or remove agricultural land out of production for the project. As of January 2018, other EAA owners of parcels larger than 150 acres who were contacted by the SFWMD have been largely unresponsive about their willingness to sell or exchange. The SFWMD's eminent domain authority for this PACR has been prohibited by State law. **Section 3.2.1.2** provides more information on locations identified for this PACR.

Adjacent wildlife management areas (Holey Land and Rotenberger) were not included or analyzed during CEPP or the CEPP PACR. These lands were screened out during the CEPP planning effort due to water quality concerns raised by environmental stakeholders. During CEPP planning, northern WCA 3A, Holey Land was considered as a Northern Distribution Management Measure, specifically as a flow-through wetland to receive outflows from CEPP's proposed storage and treatment management measures. The Holey Land flow-through wetland was eventually screened out due to environmental and secondary effects.

In addition, using Holey Land as storage/treatment for CERP does not appear to align with the objectives outlined in the Everglades Forever Act (EFA; Chapter 373.4592, F.S.). The EFA states, "The Everglades Program will contribute to the restoration of the Rotenberger and Holey Land tracts. The Everglades Construction Project provides a first step toward restoration by improving hydroperiod with treated water for the Rotenberger tract and by providing a source of treated water for the Holey Land."

3.2 SCREENING

3.2.1 Screening of Storage, Treatment, and Conveyance

Reducing high-volume freshwater discharges to the Northern Estuaries and improving the flows provided to the Everglades are both objectives of the CEPP PACR. Providing additional canal conveyance, storage, and treatment are necessary to achieve both of these objectives. In addition, utilization of operational flexibility within the existing 2008 LORS, as generally envisioned in CEPP, and the implementation of further conveyance improvements south of Lake Okeechobee within the EAA are also expected to assist in achieving CEPP PACR objectives (**Section 1.7**, **Table 1-2**). Similar to the authorized CEPP plan, water will be redirected from Lake Okeechobee through EAA canals (instead of discharged to the Northern Estuaries), stored, treated, and delivered to the Everglades.

Establishing the existing quantity of water currently entering WCA 3A (existing water budget) and quantifying potential new water that could be captured from excess water currently discharged from Lake

Okeechobee to the Northern Estuaries was a prerequisite to determining how much storage and treatment was needed. The CEPP PACR formulation efforts built on those completed in CEPP to quantify flows entering WCA 2A and WCA 3A, identified by a transect known as the “Red line” (see **Figure 3-1**). Sources of water include runoff from the EAA, C-139, and C-139 Annex Basins and discharges from Lake Okeechobee. Proposed non-CEPP PACR projects, including the SFWMD’s Restoration Strategies projects, will ensure that water considered part of the existing water budget will undergo treatment to meet applicable State water quality standards. More information on the SFWMD’s Restoration Strategies is provided in **Section 2.0**. A significant percentage of the existing inflows to WCA 2A from STA-2 and WCA 1 are subsequently discharged to eastern WCA 3A through the S-11 gated spillways. Because STA-2 outflows may be affected by additional storage and treatment within the EAA and because STA-2 outflows contribute to WCA 3A inflows, STA-2 discharges were included in the quantification of existing water. The total volume of water currently entering WCA 2A and WCA 3A from STA 2 and STA 3/4 is approximately 760,000 ac-ft on an average annual basis, based on hydrologic modeling for a historical climatologic period from 1965 to 2005.

To quantify the maximum potential water available, a FWO project condition baseline scenario was evaluated with the CEPP PACR hydrologic modeling tools to identify water discharged from Lake Okeechobee in excess of defined target flows for the Northern Estuaries. Modeled simulated volume of over 500,000 ac-ft of excess water is discharged to the Northern Estuaries on an average annual basis under LORS. The CEPP PACR plan formulation activities developed scenarios that redirected damaging discharges to the Northern Estuaries, south to the central Everglades consistent with CERP goals and subject to the project objectives and constraints.

3.2.1.1 Screening of Storage, Treatment, and Conveyance Improvement Management Measures

Management measures were compiled from previous CERP, EAA Reservoirs Phase I and more recently CEPP, planning efforts and new measures were identified for the CEPP PACR consistent with study objectives. See **Appendix E** for details of potential storage, treatment, and conveyance improvement management measures. These measures were screened during preparation of the CEPP PACR consistent with the study objectives and criteria which are listed below, many of which were previously established specifically for CEPP:

- **Completeness:** the extent to which an alternative plan provides and accounts for all necessary investments or other actions to ensure the realization of the planned effects
- **Effectiveness:** the extent to which an alternative plan alleviates the specified problems and achieves the specified opportunities
- **Efficiency:** the extent to which an alternative plan is the most cost-effective means of alleviating the specified problems and realizing the specified opportunities
- **Acceptability:** the workability and viability of the alternative plan with respect to acceptance by State and local entities and the public and compatibility with existing laws, regulations, and public policies
- **Operational Flexibility:** ability to adapt to changing conditions
- **Environmental Effects:** avoidance of negative impacts
- **Constructability:** feasibility of construction
- **Human Health and Safety**: avoid or minimize risks
- **Land Availability:** sufficient or suitable property for construction and operation

An array of distinct management measures were identified with multiple size and configuration potentials for each measure. The primary factors in eliminating management measures were if the measures did not sufficiently address project objectives or would result in unacceptable impacts. No measures that would meet project objectives and avoid unacceptable impacts were eliminated solely based on high costs. Screening resulted in four management measures retained for configuring size, locations, and combinability (see **Table 3-1** and **Appendix E**).

Table 3-1. Retained Storage, Treatment, and Conveyance Improvement Management Measures

Storage Management Measures	Treatment Management Measures	Conveyance Improvement Management Measures
Above-Ground Storage Reservoir	Stormwater Treatment Area	Everglades Agricultural Area Canal Improvements
Lake Okeechobee Operational Changes		

3.2.1.2 Locations of Storage, Treatment, and Conveyance Improvement Management Measures

Identifying an acceptable storage and treatment location governed the range and scale of management measures that could be considered. Storage and treatment locations were identified based on the results of siting analysis conducted during previously-completed CERP planning activities and reaffirmed during development of CEPP, which included consideration of the regional geographic location and a specific project footprint.

After considering the possible regional geographic areas, the specific location for the storage and treatment management measures was identified based upon the factors listed in **Table 3-2**.

Table 3-2. Siting Criteria for Locating Storage and Treatment Features

Infrastructure	Socio-Political and Environmental	Hydrology	Construction Efficiency
• Use of existing major canal networks (Miami Canal, Bolles & Cross Canal and North New River Canal) • Proximity to move water from water source (Lake Okeechobee) • Proximity to existing public works (STAs, existing pump stations, roads, minor canal networks)	• Avoid unwilling sellers, no eminent domain authority in the EAA (for purposes of implementing the EAA reservoir project) • Minimize impacts to local tax rolls • Use lands already acquired for purpose of environmental restoration • Minimize effects on Cultural Resources • Use previously impacted lands	• Reduce regulatory releases to the Northern Estuaries • Hydraulic connection to Lake Okeechobee with flexibility to manage high water levels • Improve the timing of environmental releases to the WCAs	• Topography • Muck depths • Construction and maintenance access • Seepage management • Availability of construction material

It is unlikely that any other component of the CERP has been modeled and evaluated more than the EAA Storage Reservoir. Siting of the EAA Storage Reservoir was studied as part of the Reconnaissance Phase of CERP as well as in the Feasibility Phase of CERP. Additionally, the EAA Storage Reservoir was authorized as part of the WRDA 2000 and studied as part of the EAA Storage Reservoirs Phase 1, Project Implementation Report. The EAA Storage Reservoir was also evaluated in the 2007 Reservoir Optimization study and in CEPP.

Findings from the Reconnaissance Study and continued evaluations during the CERP Feasibility Study were used to support the 1997 purchase of the 45,000-acre tract from the Talisman Sugar Corporation. The Department of the Interior and the State of Florida completed the $133.5 million transaction to help restore more natural flows of water through the southern parts of Florida and into ENP.

The CERP or Restudy, which was finalized in 1999, included an EAA Storage Reservoir with storage volumes ranging from 240,000 to 360,000 ac-ft. Then WRDA 2000 authorized Phase 1 of the EAA Storage Reservoir project, consisting of 240,000 ac-ft of storage, operated to achieve the multiple purposes of meeting EAA agricultural irrigation demands, capturing Lake Okeechobee regulatory releases and providing environmental water deliveries to the Everglades. In reference to the EAA Storage Reservoir project, the WRDA 2000 report of the United States Committee on Environment and Public Works (Report 106-362 dated July 27, 2000) stated, “The Army Corps should maximize use of lands acquired through the Talisman purchase and exchange, as well as other EAA lands held by the non-Federal sponsor, in the design and construction of Phase 1 of this project feature. Further, the Corps should seek to take full advantage of the Talisman lands by maximizing the depth of water stored in the Talisman Water Storage Reservoir.”

The regional location for suitable storage and treatment measures was determined by considering the potential impacts associated with the conversion of prime and unique farmland, identifying locations that could meet project objectives, and maximizing use of existing infrastructure.

Building from CERP, which was reaffirmed in the authorized CEPP plan, land within the EAA, specifically the A-1 parcel, the A-2 parcel, and additional State-owned and privately-owned land located west of the A-2 parcel (referred to as the A-2 Expansion area) offer the greatest potential for additional cost-effective water storage and treatment within the EAA, due to their proximity to existing infrastructure and publicly owned land. These locations also provide a source of inflow and linkage to the Everglades, which is the targeted flow area for this project (see **Figure 3-1**).

Consistent with previous planning efforts, including the CEPP, the storage and treatment management measures south of Lake Okeechobee are recommended to be located on and maximize the usage of the A-1 parcel and the A-2 parcel (see **Figure 3-2**). The identified land is located between and adjacent to the North New River and Miami Canals which minimizes the need for new conveyance features to move water from Lake Okeechobee to the project components and the WCAs. The land parcels are also adjacent, or in close proximity, to existing water quality treatment facilities (STA 3/4 and STA 2) which provides the opportunity to optimize operations with minimal costs. The FWO project condition includes a shallow FEB on the A-1 parcel that was completed in July 2015 and is being operated by SFWMD to assist in achieving State water quality standards in the Everglades. The FWO project condition for the A-2 parcel includes a shallow FEB, authorized under CEPP but not yet constructed.

The CEPP recommended plan did not preclude future increments of CERP for additional storage in the EAA and the CEPP report documented that the A-2 FEB could be converted to an STA or deeper storage to increase water deliveries to the Everglades. Similarly, the A-1 FEB was designed and constructed to allow for modification by leaving land available on the project site to provide for higher levees and deeper storage.

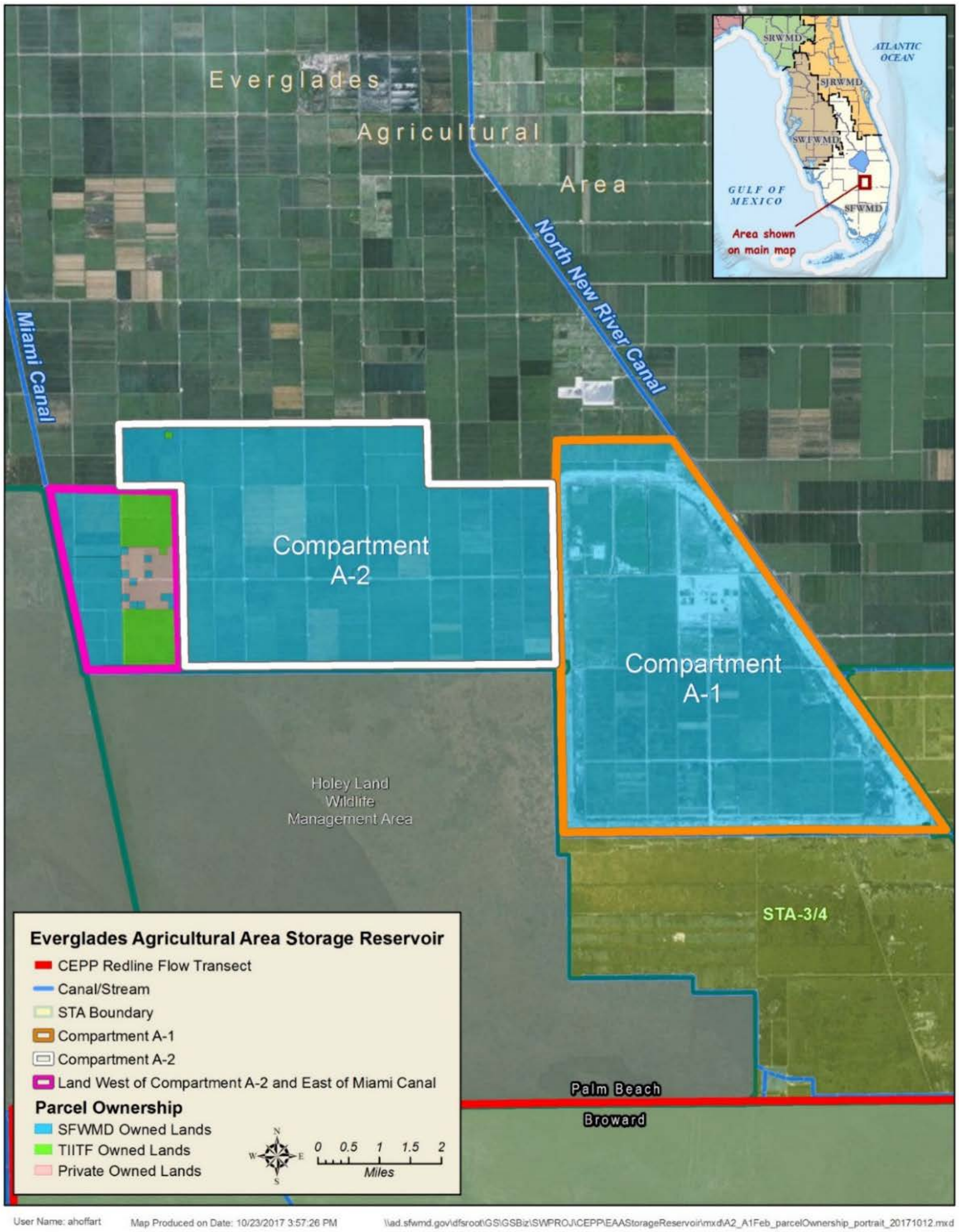

Figure 3-2. A-1 and A-2 Parcels and A-2 Expansion Area

The formulation of CEPP PACR management measures assumed that the A-1 FEB could be modified and integrated with the CEPP PACR features as long as project constraints for water quality and water supply would not be violated. Any CEPP PACR activities that require modifications to the State's Restoration Strategies projects may require modifications to: (1) the State permits authorizing the Restoration Strategies projects, and (2) Federal permits, such as CWA NPDES permits. Additionally, any modifications to SFWMD Restoration Strategies facilities that may impact the structures or function of any Federal project, may also require a Section 408 review.

Consistent with the CEPP siting analysis, and previous planning efforts with direction to maximizing the use of public lands in the EAA, the A-1 and A-2 parcels and the A-2 Expansion area, which is approximately 34,500 acres combined, is the largest, most efficient footprint for this next increment of CERP storage. For the planning process in support of this CEPP PACR, this 34,500-acre area was used to develop and configure potential water storage and treatment components to reduce high-volume freshwater discharges to the Northern Estuaries and improve flows to the Everglades. For the screening analysis, it was assumed that approximately 31,000 acres (or 90% of 34,500 acres) would be potentially available for effective storage and/or treatment areas. The remaining 10 percent was assumed necessary for perimeter and internal embankments, inflow and outflow canals, seepage canals, water control structures, pump stations, and other related features.

As **Table 3-1** shows, conveyance improvement management measures retained for further analysis include EAA canal improvements. Improvements to both the North New River and Miami Canals were evaluated.

3.2.1.3 Role of Modeling

The modeling and design of the EAA Storage Reservoir was based on the framework developed in the CEPP and peer-reviewed tools that provide a sound engineering and scientific foundation. The CEPP PACR analysis was performed using a suite of tools previously developed, calibrated, applied, documented and reviewed during the CEPP planning process. Detailed description of the model peer review and certification process is described in the CEPP PIR, Appendix G. Model documentation reports have been provided in **Appendix A, Annex A-2** which provides detailed information on model assumptions, parameters, inputs, and pertinent references of model development and validation.

During the ongoing planning process, SFWMD modelers have many opportunities for refinement of modeling products. Scientists, engineers, and the public provide feedback that is incorporated in the following phases (**Figure 3-3**):

1. Screening modeling, the same used in the development of Restoration Strategies and CEPP, including the Dynamic Model for Stormwater Treatment Areas (DMSTA), assisted in selection and sizing of features. To achieve CERP flows south into the Everglades and meet State water quality standards, additional acres of stormwater treatment areas, working in conjunction with the existing STAs, were identified in this step.
2. Using the Regional Simulation Model (RSM), detailed modeling of alternatives determined how to route water to achieve project benefits. This detailed modeling incorporated the new STA acreage, identified in the screening level modeling, into the system. Using the features on the ground today and authorized in CEPP, the modeling also diverted Lake Okeechobee discharges south to the Everglades.
3. Results of the RSM were used to develop habitat units.
4. Refinement of detailed modeling of a highly performing alternative incorporates feedback and information gained in earlier steps.

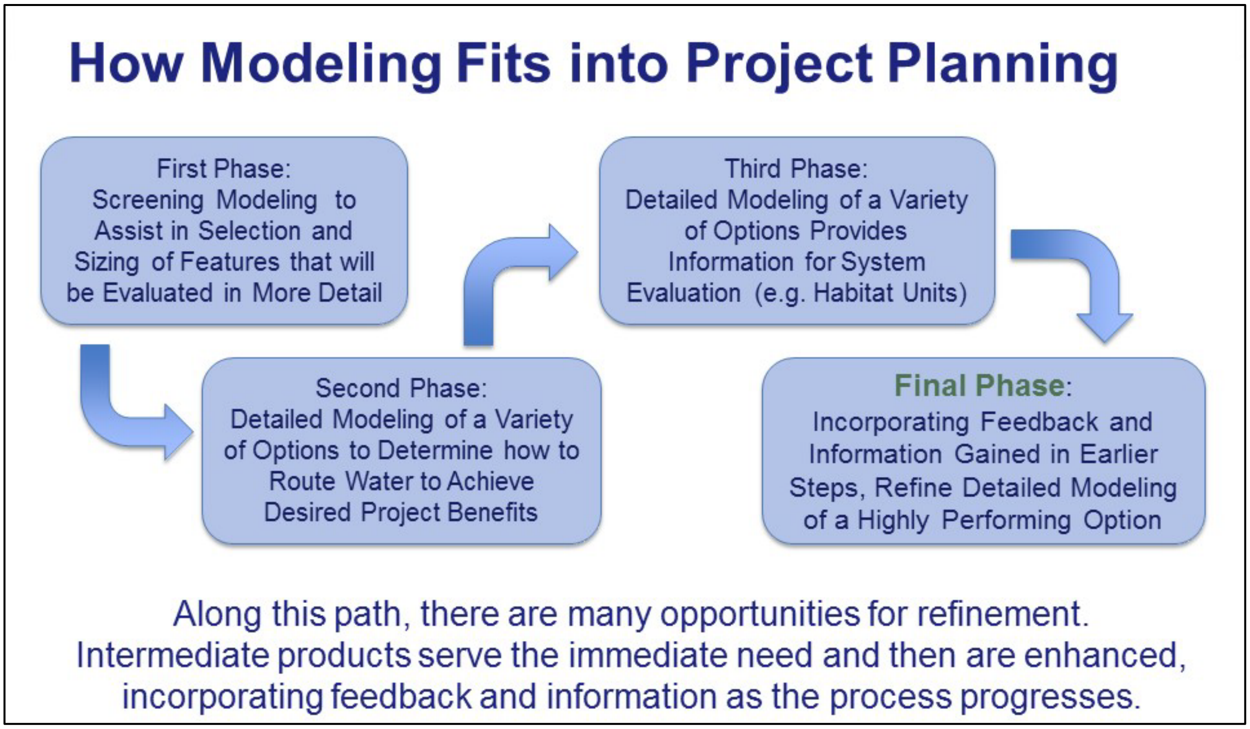

Figure 3-3. Modeling Process in Plan Formulation of Storage, Treatment, and Conveyance Improvement Options

The CEPP planning process applied the Reservoir Sizing and Operations Screening (RESOPS) model to quickly predict water deliveries, timing of flow, and reduction in discharge to the Northern Estuaries for thousands of scales and configurations of management measures. While the District's RESOPS model that was used in CEPP was not explicitly used in the CEPP PACR, the knowledge gained from the CEPP RESOPS simulations was integrated during the screening process during this study.

The primary tool used during screening was the DMSTA, which was used to define and assess combinations of management measures. DMSTA has been commonly used by both State and Federal agencies for STA design and evaluation since 2001 and is the best available tool for simulating phosphorus removal performance of existing or proposed storage reservoir and STAs. DMSTA is configured to allow integration with the District's regional hydrologic models and has been configured to simulate complex regional networks of STAs and reservoirs.

During each phase of the CEPP PACR modeling, hydraulic loading rates, flow regimes and water depths simulated by DMSTA were evaluated to ensure consistency with SFWMD's Restoration Strategies modeling which was finalized in 2012. It also confirmed they were within acceptable ranges consistent with applicable water quality planning standards that were collaboratively developed and/or approved by the U.S. Environmental Protection Agency and the Florida Department of Environmental Protection. For this study, only STA-2, STA-3/4 (and any new STA associated with the EAA Reservoir, when appropriate) were evaluated, as these are the only STAs that are proposed to receive additional flows as a result of the proposed CEPP PACR alternatives.

The underlying DMSTA-assumed hydrology was updated to use Regional Simulation Model for Basins (RSM-BN) estimates in place of previously used South Florida Water Management Model (SFWMM) outcomes. These tool improvements helped to increase the correspondence between RSM and DMSTA further justifying the assertion that modeled flow used in project benefit calculations are consistent with planning for water quality standards. In no other previous project (including CEPP) has there been this level of consistency between DMSTA and the corresponding hydrologic model (RSM or SFWMM).

In addition, DMSTA simulations were used to ensure that the long-term simulated total phosphorus concentration was at or below the planning-level target of 13 parts per billion (ppb) or micrograms per liter (µg/L) for a variety of storage and treatment facility sizes. Due to uncertainty associated with DSMTA-simulated low level annual phosphorus concentrations for STA discharges, annual values less than 12 ppb were replaced with a value of 12 ppb, prior to calculating the long-term total phosphorus concentration, which is referred to as the adjusted DMSTA outflow total phosphorus concentration. This approach is consistent with CEPP and Restoration Strategies.

The SFWMD's RSM-BN was used to evaluate EAA canal conveyance improvements south of Lake Okeechobee in the EAA that align with the storage and treatment options to maximize reductions in Lake Okeechobee discharges to the Northern Estuaries (see **Appendix E.3.2**). Since CEPP eliminated a majority of the low to moderate discharge events to the Northern Estuaries from Lake Okeechobee, CEPP PACR plan formulation screening focused on storage, treatment and conveyance options that would reduce the lake discharge events that were not addressed by CEPP. Discharge events from Lake Okeechobee to the Northern Estuaries, as simulated with CEPP's project features in place (CEPP PACR FWO), were summarized and are provided in **Table 3-3**. In an attempt to capture all 12 events, screening began by simulating 4,500 cfs of additional EAA conveyance (3,000 cfs in the Miami Canal and 1,500 cfs in the North New River Canal) and then iteratively decreased and the mean monthly flows from Lake Okeechobee to the Northern Estuaries were evaluated with each capacity reduction.

Table 3-3. Discharge Events from Lake Okeechobee to the Northern Estuaries with CEPP

Event #	Start Month/Year	End Month/Year	Duration (months)	Average Monthly Flow (cfs)
1	August 1966	September 1966	2	2,348
2	July 1968	July 1968	1	1,024
3	October 1969	April 1970	7	3,163
4	October 1979	October 1979	1	2,526
5	February 1983	April 1983	3	2,566
6	October 1994	January 1995	4	1,252
7	September 1995	November 1995	3	3,760
8	January 1998	May 1998	4	4,330
9	June 2003	September 2003	4	2,698
10	October 2004	October 2004	1	2,875
11	June 2005	July 2005	2	2,364
12	October 2005	December 2005	3	1,740
		Total/Average	**35**	**2,554**

The District's RSM-GL was used to verify that the southern distribution and conveyance improvements included in CEPP could accommodate the additional Everglades flows being evaluated in the CEPP PACR.

In addition to determining the configuration of storage and treatment management measures on the site footprint, consideration was given to incorporating assumed operational flexibility in Lake Okeechobee (within the existing 2008 LORS) when additional storage capacity is available by using the Lake

Okeechobee Operations Screening (LOOPS) model. More specifically, the LOOPS screening modeling included proposed revisions to the 2008 LORS flow chart guidance of maximum allowable discharges, which are dependent on the following criteria: class limits for Lake Okeechobee inflow and climate forecasts, including tributary hydrologic conditions, seasonal climate outlook, and multi-seasonal climate outlook; stage level, as delineated by the Regulation Schedule management bands; and stage trends (whether water levels are receding or ascending). The 2008 LORS Regulation Schedule management bands and sub-bands were not modified, consistent with the original modeling intent to remain within the operational flexibility available in the 2008 LORS. Most of the 2008 LORS refinements applied in the CEPP PACR modeling lie within the bounds of the operational limits and flexibility available in the current 2008 LORS, with the exception of the adjustments made to the class limits for the Lake Okeechobee inflow and climate forecasts. Under some hydrologic conditions, the class limit adjustments made to the Lake Okeechobee inflow and climate forecasts reduced the magnitude of allowable discharges from the Lake, thereby resulting in storage of additional water in the Lake to optimize system-wide performance and ensure compliance with Savings Clause requirements. These class limit changes represent a change in the flow chart guidance that extends beyond the inherent flexibility in the current 2008 LORS. Therefore, throughout the alternative plan formulation process, the proposed revisions to Lake Okeechobee operations are therefore denoted as “within the assumed operational flexibility of the 2008 LORS” (or similar), consistent with the information available during CEPP formulation. The model assumptions for the LORS 2008 operation schedule which identify the changes in the class limits and allowable discharges are provided in the **Appendix A, Annex A-2, Figure C-1**.

3.2.1.4 Storage and Treatment Options Previously Identified in the EAA

During CEPP planning, nine highly functioning combinations of storage and treatment were identified with three different Lake Okeechobee operational measures, which resulted in 27 options that were evaluated during screening, as summarized in **Table 3-4**.

Table 3-4. Storage and Treatment Options Identified in CEPP

<table>
<tr><th>Storage and Treatment Configuration</th><th>Lake Okeechobee Operations</th></tr>
<tr><td>FEB</td><td rowspan="14">Water Supply Optimized
Estuarine Performance Optimized
Lake Okeechobee Performance Optimized</td></tr>
<tr><td>28,000 acres</td></tr>
<tr><td>4 ft Shallow Storage & STA</td></tr>
<tr><td>24,000-acre Reservoir & 4,000-acre STA</td></tr>
<tr><td>14,000-acre Reservoir & 14,000-acre STA</td></tr>
<tr><td>6 ft Deep Storage & STA</td></tr>
<tr><td>24,000-acre Reservoir & 4,000-acre STA</td></tr>
<tr><td>11,000-acre Reservoir & 17,000-acre STA</td></tr>
<tr><td>12 ft Deep Storage & STA</td></tr>
<tr><td>24,000-acre Reservoir & 4,000-acre STA</td></tr>
<tr><td>21,000-acre Reservoir & 7,000-acre STA</td></tr>
<tr><td>17,000-acre Reservoir & 11,000-acre STA</td></tr>
<tr><td>STA</td></tr>
<tr><td>28,000 acres</td></tr>
</table>

The previous CEPP screening effort resulted in two cost-effective measures, which were as follows:

- A 28,000-acre by 4-ft-deep FEB, located on the A-1 and A-2 parcels, with Lake Okeechobee operations optimized for agricultural water supply in the EAA, provided approximately 200,000 ac-ft of additional water annually to the Everglades.
- A 21,000-acre by 12-ft-deep reservoir, located on the A-1 and A-2 parcels, with Lake Okeechobee operations optimized for agricultural water supply in the EAA, with an additional 7,000-acre STA, provided the greatest benefits to the Northern Estuaries and Everglades and delivered up to 240,000 ac-ft of additional water annually to the Everglades.

Screening analysis was also previously conducted and documented in the Revised Draft Integrated PIR and EIS for the EAA Storage Reservoirs dated February 2006. Results of the screening analysis indicated that the EAA Storage Reservoir component as described in the Restudy achieves the desired benefits in a cost-effective manner. Screening analysis led the formulation of five alternative plans with a 360,000 ac-ft storage reservoir on land ranging from 26,500 to 62,000 acres located predominantly on the A-1 and A-2 parcels between the Miami and North New River Canals.

Detailed incremental dam height alternatives were evaluated for cost effectiveness during the development of the Revised Draft Integrated PIR as well as the Basis of Design Report for the EAA A-1 Reservoir developed in parallel with the ongoing Acceler8 program. In addition, during the design of the A-1 reservoir, a test cell program was initiated for the design and construction of field scale embankments to measure seepage performance of the proposed dam sections. Two test cells were constructed to the planned full test depth of 12 ft, one with a cutoff wall and one without a cutoff wall. The test cell without a cutoff wall “leaked excessively” during the initial filling operation with noticeable boils emanating from the cap rock surface outside the test embankment. The test on the cell without the cutoff wall was interrupted prior to filling to the full (12-ft) depth to protect the integrity of the embankment. The test was successfully completed on the cell with a cutoff wall and the seepage modeling effort was calibrated to the test cell results for use in the final design on the A-1 reservoir. It was evident that embankment sections with no cutoff features were not an acceptable alternative for effective water storage on this geology.

The results of the test cell program and design on the A-1 reservoir at that time indicated that the use of a cutoff wall would be required, and it needed to extend at least 34’ below the existing cap rock surface. Even with the cutoff wall, seepage collection and return systems would be required to minimize water loss and impacts to adjacent land owners.

Additional features associated with deeper reservoirs will result in increased cost per acre foot of storage, including:

- Deeper and more robust cutoff requirements to minimize off site seepage impacts
- Additional seepage pumping resulting in long term O&M costs
- Additional embankment fill and slope protection requirements
- Wave heights increase resulting in greater superiority and embankment costs
- Reduced storage efficiency
- Additional high head pumping, already considered to be significant

As referenced in **Section 3.2.1.2** above and given the limitations on the land area available for A-2 reservoir and attendant STA(s), the dam heights for the A-2 reservoir were based on maximizing available land area for the reservoir component itself and still meet the storage requirements for the 240,000 ac-ft and 360,000 ac-ft alternatives respectively. By inspection, minimizing the storage depth to the least height possible and therefore minimizing the expense of seepage management and cutoff wall construction will be the most cost-efficient approach to storing a given volume of water required on a given piece of land.

Based on the information summarized above, four storage and treatment options, four conveyance improvement options and two reservoir operations options (See **Table 3-5**) were developed and evaluated during screening.

Table 3-5. Resulting Storage, Treatment, and Conveyance Improvement Options

<table>
<tr><th>Storage and Treatment</th><th>Conveyance Improvement</th><th>Reservoir Operations</th></tr>
<tr><td>240,000 ac-ft of Storage</td><td rowspan="4">4,000 cfs of additional conveyance capacity in the Miami Canal and 3,500 cfs of additional capacity in the North New River Canal
3,000 cfs of additional conveyance capacity in the Miami Canal and 1,500 cfs of additional conveyance capacity in the North New River Canal
1,000 cfs of additional conveyance capacity in the Miami Canal and 200 cfs of additional conveyance capacity in the North New River Canal
No conveyance improvements to the existing Miami Canal and North New River Canal</td><td rowspan="4">Environmental water supply deliveries
Multi-purpose water supply deliveries (environmental water supply deliveries and other water related needs)</td></tr>
<tr><td>10,500-acre by 23 ft deep above-ground reservoir (on western A-2 and A-2 Expansion area); 6,500-acre STA (on eastern A-2); 16,500-acre by 4 ft deep Shallow Reservoir (or FEB) on A-1
10,500-acre by 23 ft deep above-ground reservoir (on eastern A-2); 6,500-acre STA (on western A-2 and A-2 Expansion area); 16,500-acre by 4 ft deep Shallow Reservoir (or FEB) on A-1</td></tr>
<tr><td>360,000 ac-ft of Storage</td></tr>
<tr><td>20,500-acre by 18 ft deep above-ground reservoir (on A-2, A-2 Expansion area and northern A-1) and 11,500-acre STA (on southern A-1)
20,500-acre by 18 ft deep above-ground reservoir (on A-1 and A-2) and 11,500-acre STA (on western A-2 and A-2 Expansion area)</td></tr>
</table>

3.2.1.5 Screening Evaluation Criteria

Screening of the storage and treatment, conveyance improvement, and reservoir operations options summarized in **Table 3-5** was conducted using screening criteria, which are listed in **Table 3-6**, that correspond to the primary objectives of the CEPP PACR. See **Appendix E** for detailed criteria description, evaluation tools used, methodology, and results.

A comparison of CERP to its pre-CERP baseline showed CERP reduced average annual regulatory releases to the estuaries by approximately 80%. Screening efforts in plan formulation utilized this CERP goal to achieve an 80% reduction in damaging discharges to the Northern Estuaries from Lake Okeechobee. These flows will be redirected south into the central Everglades as identified in the CEPP. The CEPP plan was a first incremental step in Everglades restoration and did not formally quantify the performance of the CERP program, but the CEPP report stated that the project performance increased average annual flow south by approximately 210,000 ac-ft or approximately two-thirds of the CERP. The screening target for this PACR is approximately 300,000 ac-ft of average annual flow, which was used in screening for this study and is consistent with CERP.

Table 3-6. Screening Criteria for Storage, Treatment, and Conveyance Options

Criteria	Objectives
Northern Estuary Conditions	Reduction in high-volume freshwater discharges from Lake Okeechobee to the St. Lucie and Caloosahatchee Estuaries
Improved Flow to the Everglades	Provide additional flow to the Everglades above the FWO project condition to achieve CERP goal
Water Quality	Achievement of phosphorus effluent limit for discharges from the Everglades STAs

3.2.1.6 Results of Screening Analysis

The screening effort resulted in the following options being identified for further evaluation. See **Appendix E** for detailed results.

Storage and Treatment

- 10,500-acre by 23-ft-deep above-ground reservoir (on western A-2 and A-2 Expansion area); 6,500-acre STA (on eastern A-2); 16,500-acre by 4 ft deep Shallow Reservoir (or FEB) on A-1
- 10,500-acre by 23-ft-deep above-ground reservoir (on eastern A-2); 6,500-acre STA (on western A-2 and A-2 Expansion area); 16,500-acre by 4 ft deep Shallow Reservoir (or FEB) on A-1
- 20,500-acre by 18-ft-deep above-ground reservoir (on A-2, A-2 Expansion area and northern A-1) and 11,500-acre STA (on southern A-1)
- 20,500-acre by 18-ft-deep above-ground reservoir (on A-1 and A-2) and 11,500-acre STA (on western A-2 and A-2 Expansion area)

Conveyance Improvement

- 1,000 cfs of additional conveyance capacity in the Miami Canal and 200 cfs of additional conveyance capacity in the North New River Canal

Reservoir Operations

- Multi-purpose water supply deliveries (environmental water supply deliveries and other water related needs)

Based on the results of the screening analysis, the options identified above were used to develop an array of five (5) alternatives to be further evaluated which are described in detail in **Section 3.4**.

During plan formulation, a consideration was made to establish a 240,000 ac-ft reservoir option on the A-1 and A-2 parcels similar to that of the 360,000 ac-ft alternative configurations to reduce embankment height and afford some cost savings. Utilizing the “Principles and Guidelines” criteria that include the four accounts, this option was screened out for lack of acceptability. Acceptability is the workability and viability of the alternative plan with respect to acceptance by State and local entities and the public and compatibility with existing laws, regulations, and public policies. State law specifically identified a 240,000 ac-ft reservoir on the A-2 parcel and public opinion generally opposed the use of the A-1 FEB site for deep storage due to the inclusion and linkage of the A-1 FEB in the Restoration Strategies program.

3.3 CONSIDERATION OF THE COMPREHENSIVE REVIEW STUDY (“YELLOW BOOK”) ALTERNATIVE FOR THE EAA STORAGE RESERVOIR (COMPONENT G)

The CERP Programmatic Regulations at 33 CFR 385.26 state the following in regard to formulation of alternatives in PIRs:

In formulating alternative plans to be evaluated, the project as described in the (Central and Southern Florida Project, Comprehensive Review Study) ''Final Integrated Feasibility Report and Programmatic Environmental Impact Statement,'' dated April 1, 1999 shall be included as one of the alternative plans that is evaluated.

The Comprehensive Review Study is commonly referred to as the "Yellow Book." As presented in the "Yellow Book," the EAA Storage Reservoir (CERP Component G) would improve timing of environmental deliveries to the WCAs, including reducing damaging flood releases from the EAA to the WCAs; reducing Lake Okeechobee regulatory releases to estuaries; meeting supplemental irrigation demands; and increasing flood protection within the EAA. The "Yellow Book" plan called for the reservoir to be divided into three compartments totaling approximately 60,000 acres:

Compartment 1: 20,000 acres, meets EAA irrigation demands only. The source of water is excess EAA runoff. Inlet capacities for excess runoff are 2,700 and 2,300 cfs, for the Miami Canal and the North New River Canal Basins, respectively. Outlet capacities for EAA demands are 3,000 and 4,400 cfs, for the Miami Canal and the North New River Canal Basins. Overflow to compartment 2 occurs when the depth of water approaches 6 feet maximum and Lake Okeechobee regulatory discharges are not occurring or impending. Excess EAA runoff is diverted to compartment 3 only if WCA 3A is too deep.

Compartment 2: 20,000 acres, meets environmental demands as a priority, but can supply a portion of EAA irrigation demands if environmental demands equal zero. The sources of water are overflow from compartment 1 and Lake Okeechobee regulatory releases including the weather forecasting to initiate storage usage. Compartment 2A will be operated as a dry storage reservoir and discharges made down to 18 inches below ground level.

Compartment 3: 20,000 acres, meets environmental demands as a priority. The sources of water are overflow from compartments 1 and 2A and Lake Okeechobee regulatory releases only during the extreme wet events. Compartment 3 will be operated as a dry storage reservoir and discharges made down to 18 inches below ground level.

Since storage of water within the EAA had been established as one of the primary management measures contributing to the goals and purposes of the Comprehensive Review Study, approximately 45,000 acres were acquired in the EAA (the Talisman Lands Exchange Transaction) using Federal funds appropriated to the Department of Interior under the authority of the 1996 Farm Bill (Federal Agriculture Improvement and Reform Act of 1996, P.L. 104-127, 110 Stat. 1022). As the Comprehensive Review Study neared completion, there was an effort to identify early opportunities to obtain system-wide benefits by utilizing readily available lands. Therefore, the EAA Storage Reservoir component of the CERP was separated into two phases to expedite implementation.

The first phase included the construction of two equally sized compartments of 20,000 acres at 6-foot maximum depths. This first phase was conditionally authorized by Congress in Section 601 of the Water Resources Development Act of 2000 (P.L. 106-541). Based on this phased approach, a Project Management Plan was prepared to address the EAA Storage Reservoir Project - Phase 1. Phase 1 included two conceptual 20,000-acre (6-ft-deep) compartments capable of storing up to 120,000 ac-ft each. Compartment 1 would be used to meet EAA agricultural irrigation demands by storing excess EAA runoff. Compartment 2 was envisioned to capture both Lake Okeechobee regulatory releases and Compartment 1 overflow and to supply environmental water deliveries to the WCAs. However, as development of the EAA Storage Reservoir Integrated Phase 1 PIR/EIS progressed in 2005-2006, it became apparent that formulating and evaluating the two phases separately would result in an incomplete solution to the problems the EAA Storage Reservoir project was intended to address. Not constraining the plan formulation and evaluation and design to phases or the three cell configurations as initially authorized indicated that the design optimization would produce a more cost-effective plan than a phased approach. Therefore, it was subsequently determined that the entire EAA project should be formulated and evaluated as one project.

Technical studies in support of the Revised Draft EAA Storage Reservoir Integrated PIR/EIS in 2006 evaluated the CERP 360,000 ac-ft of above ground storage including the "Yellow Book" alternative. In the technical evaluations that were conducted at that time, the "Yellow Book" alternative (Alternative 2) included a total storage area of 62,000 acres with a normal pool depth of 6 ft. This alternative would have used the entire 31,500-acre footprint of Compartment A (same lands referred to as A-1 and A-2 parcels in this PACR), and the additional 30,500 acres required for this alternative would consist of prime and unique farm lands located between the Miami Canal and North New River Canal, west and north of Compartment A.

Though it was never finalized, the Revised Draft EAA Storage Reservoir Integrated PIR/EIS included planning level analyses of project alternatives for environmental effects and project costs. The technical analyses indicated that the "Yellow Book" alternative would provide the lowest habitat unit lift above the "No Action Alternative" among all of the deeper alternatives evaluated, would remove the most prime and unique farmland from agricultural production of any alternative, and would have the highest potential for socioeconomic impact. The analysis indicated that the "Yellow Book" alternative would be unacceptable and not cost effective. Thus, the "Yellow Book" alternative was not identified as the Tentatively Selected Plan at the draft stage of the PIR. While the Revised Draft Integrated PIR/EIS was not finalized, the alternative analysis therein was subjected to review and provides a useful historical perspective and valuable technical information regarding the analysis of EAA storage alternatives.

The CEPP plan formulation process initiated several years later acknowledged these previous findings and identified acceptable locations for storage options considering regional geographic location and the specific project footprint that could meet project objectives, minimize the requirements for additional land acquisition, and maximize use of existing infrastructure. After considering the previous studies and possible regional geographic areas, the specific location for the storage and treatment measures within EAA was selected for the CEPP plan. The same set of siting factors that were applied in development of the CEPP plan have also been used in plan formulation for the PACR (see **Table 3-2**).

In the CEPP PIR, the 27 options for storage and treatment management measures south of Lake Okeechobee were located on, and maximized the usage of, the A-1 and A-2 Compartments of EAA land south of Lake Okeechobee, which are owned by the State of Florida. The CEPP PIR proposed to implement a portion of the compartment 2 functions identified in the initially authorized CERP project. CEPP proposed to implement this component by constructing an approximately 14,000-acre FEB on the A-2 footprint with a maximum storage depth of 4 ft, which would provide approximately 60,000 ac-ft of storage by capturing Lake Okeechobee regulatory releases. Management measures were compiled from previous CERP planning efforts, and new measures were identified for CEPP. These measures were screened with criteria established specifically for CEPP, and those same criteria have been carried forward for use in developing the alternatives for the CEPP PACR (see **Section 3.2.1.1** above).

The siting analysis for this CEPP PACR identified the A-1 and A-2 parcels, on the former Talisman lands, plus the A-2 Expansion area, partially on former Talisman lands, as the largest, most efficient, and acceptable footprint for this increment of storage and treatment. In the Senate Committee Report for

WRDA 2000 (Senate Rep. 106-362, July 26, 2000), the Committee directed the USACE to maximize use of the Talisman lands acquired by the SFWMD with Department of Interior funding, as well as other EAA lands held by the non-Federal sponsor, for the design and construction of the EAA Storage Reservoir. Further, the Committee directed the USACE to take full advantage of the Talisman lands by maximizing the depth of water stored on these lands. In addition, the SFWMD team recognized that any modifications to the State Restoration Strategies on the A-1 parcel could potentially impair the functionality and effectiveness of other CERP/CEPP features and would likely require review and concurrence from USACE in accordance with 33 United States Code (U.S.C.) Section 408.

Based on a review of prior extensive evaluations for EAA storage and treatment options as summarized above, the "Yellow Book" alternative for the EAA Storage Reservoir (Component G) (consisting of three compartments at approximately 6-ft depths over approximately 60,000 acres of land) was not considered further in this CEPP PACR. The formulation and evaluation of alternatives for this PACR is consistent with Section 33 CFR 385.26 of the CERP Programmatic Regulations and the Final Draft Program-Wide Guidance Memoranda #1 and #2 regarding the development of design alternatives to optimize project features, cost-effectiveness, and satisfaction of the requirements of the CERP Programmatic Regulations. Several different storage configurations with various storage depths and a range of footprints have been developed and evaluated over the last two decades, including those identified in this PACR.

3.4 INCREMENTAL ADAPTIVE RESTORATION

The CERP provides a framework of components needed to achieve a practicable level of restoration of the Everglades. Each of the identified alternatives to be evaluated during the CEPP PACR has adopted the NRC's recommendation to use incremental adaptive restoration in fulfilling the comprehensive solution. Building on the work completed during the CEPP planning process, the CEPP PACR evaluates potential implementation of all or a portion of the CERP's recommended plan as described in the Comprehensive Review Study. The CEPP PACR TSP builds upon the benefits of CEPP and meets the CERP goal in delivering additional freshwater flow to the Everglades and environmental water supply deliveries to the Northern Estuaries providing for the remaining increments of Components G, II, C, and E in the Comprehensive Review Study.

3.5 FORMULATION OF THE ARRAY OF ALTERNATIVES

Key tenets of CEPP PACR formulation was the interdependency of project components and adherence to study objectives. Benefits are realized in the Northern Estuaries and in the Everglades (south of the storage and treatment facilities and conveyance improvements) through storage, redistribution, and conveyance of water. Combining the options identified through the alternative plan formulation screening process resulted in an array of five (5) alternatives (R240A, R240B, R360C, R360D, and C360C) to be further evaluated. See **Figure 3-4** for a graphical depiction of the array of alternatives. **Note:** Alternative C360C is not shown as it includes the exact same storage, treatment, conveyance improvements, and related infrastructure as R360C.

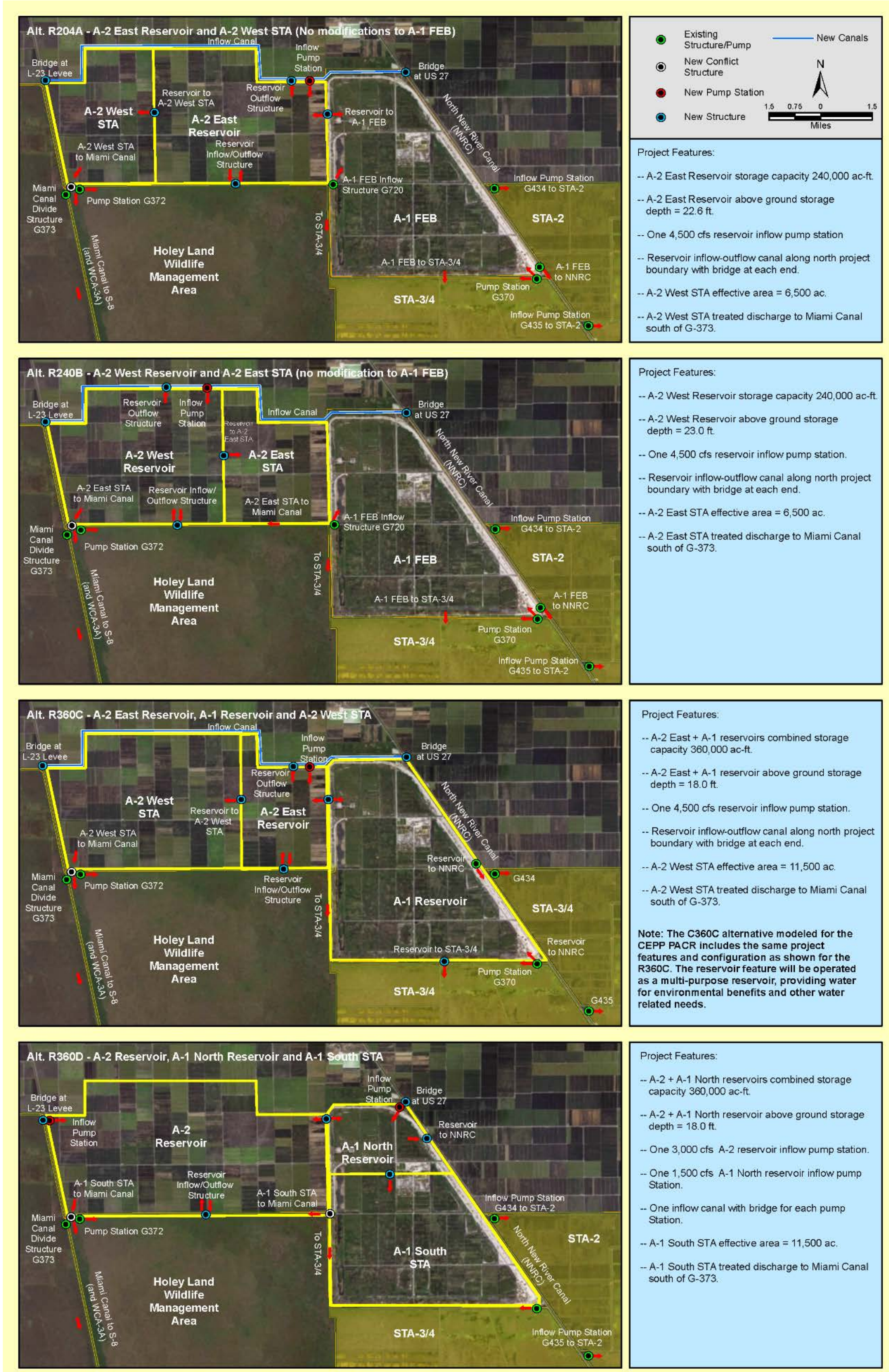

Figure 3-4. CEPP PACR Array of Alternatives

3.5.1 Alternative R240A

Alternative R240A includes a 240,000 ac-ft above-ground reservoir and a 6,500-acre STA, located on the A-2 parcel and A-2 Expansion area, that will work in conjunction with the existing 60,000 ac-ft A-1 FEB, STA-2, and STA-3/4 to meet State water quality standards. The proposed A-2 East Reservoir is 10,500 acres and designed to have a normal full storage water depth of approximately 23 feet. This alternative also includes 1,000 cfs of additional conveyance capacity in the Miami Canal within the EAA and 200 cfs of additional conveyance capacity in the North New River Canal within the EAA. For this alternative, A-2 East Reservoir outflows can be sent to the new A-2 West STA (located adjacent to and directly west of the A-2 East Reservoir), to the existing A-1 FEB, to the existing STA-2, and/or to the existing STA-3/4. Outflows from the A-2 West STA would be conveyed via a conflict structure to convey water under the STA 3/4 Inflow Canal to the Miami Canal south of the existing G-373 divide structure. A-2 East Reservoir outflows can also be conveyed to either the Miami or North New River Canals via the intake canal.

Alternative R240A also includes an intake canal located adjacent to and directly north of the A-2 West STA, the A-2 East Reservoir, and the A-1 FEB. The intake canal extends from the Miami Canal to the North New River Canal, which allows flexibility to convey water into the reservoir from either side of the project area. A new inflow pump station conveys water into the A-2 East Reservoir from the intake canal.

3.5.2 Alternative R240B

Alternative R240B includes a 240,000 ac-ft above-ground reservoir and a 6,500-acre STA, located on the A-2 parcel and A-2 Expansion area, that will work in conjunction with the existing 60,000 ac-ft A-1 FEB, STA-2 and STA-3/4 to meet State water quality standards. The proposed A-2 West Reservoir is 10,500 acres and designed to have a normal full storage water depth of approximately 23 feet. This alternative also includes 1,000 cfs of additional conveyance capacity in the Miami Canal within the EAA and 200 cfs of additional conveyance capacity in the North New River Canal within the EAA. For this alternative, A-2 West Reservoir outflows can be sent to the new A-2 East STA (located adjacent to and directly east of the A-2 West Reservoir), to the existing A-1 FEB (via the existing STA-3/4/A-1 FEB inflow canal), to the existing STA-2, and/or to the existing STA-3/4. Outflows from the A-2 East STA would be conveyed to the Miami Canal south of the existing G-373 divide structure via a new east-west A-2 East STA outflow canal located adjacent to and directly south of the A-2 West Reservoir. A-2 West Reservoir outflows can also be conveyed to either the Miami Canal via a reservoir outflow structure or to the North New River Canal via the intake canal.

Alternative R240B also includes an intake canal located adjacent to and directly north of the A-2 West Reservoir, the A-2 East STA, and the A-1 FEB. The intake canal extends from the Miami Canal to the North New River Canal, which allows flexibility to convey water into the reservoir from either side of the project area. A new inflow pump station conveys water into the A-2 West Reservoir from the intake canal.

3.5.3 Alternative R360C

Alternative R360C includes a 360,000 ac-ft above-ground reservoir and an 11,500-acre STA, located on the A-1 parcel, the A-2 parcel, and the A-2 Expansion area, that will work in conjunction with the existing STA-2 and STA-3/4 to meet State water quality standards. The proposed A-1 Reservoir and A-2 East Reservoir are 20,500 acres combined and designed to have a normal full storage water depth of approximately 18 feet. For this alternative, the existing 16,500-acre shallow A-1 FEB is modified to a reservoir. This alternative also includes 1,000 cfs of additional conveyance capacity in the Miami Canal within the EAA and 200 cfs of additional conveyance capacity in the North New River Canal within the

EAA. For this alternative, A-1 Reservoir and A-2 East Reservoir outflows can be sent to the new A-2 West STA (located adjacent to and directly west of the A-2 East Reservoir), to the existing STA-2, and/or to the existing STA-3/4. Outflows from the A-2 West STA would be via a conflict structure to convey water under the STA 3/4 Inflow Canal to the Miami Canal south of the existing G-373 divide structure. A-1 Reservoir outflows can be conveyed to the North New River Canal via a reservoir outflow structure and A-2 East Reservoir outflows can be conveyed to either the Miami or North New River Canals via the intake canal.

Alternative R360C also includes an intake canal located adjacent to and directly north of the A-2 West STA, the A-2 East Reservoir and the A-1 Reservoir. The intake canal extends from the Miami Canal to the North New River Canal, which allows flexibility to convey water into the reservoir from either side of the project area. A new inflow pump station conveys water into the A-1/A-2 East Reservoir from the intake canal.

3.5.4 Alternative R360D

Alternative R360D includes a 360,000 ac-ft above-ground reservoir and an 11,500-acre STA, located on the A-1 parcel, the A-2 parcel, and the A-2 Expansion area, that will work in conjunction with the existing STA-2 and STA-3/4 to meet State water quality standards. The proposed A-2 Reservoir and the A-1 North Reservoir are 20,500 acres combined and designed to have a normal full storage water depth of approximately 18 feet. For this alternative, the existing 16,500-acre shallow A-1 FEB is modified to be a 11,500-acre STA in the south (A-1 South STA) and a 3,500-acre reservoir in the north (A-1 North Reservoir). This alternative also includes 1,000 cfs of additional conveyance capacity in the Miami Canal within the EAA and 200 cfs of additional conveyance capacity in the North New River Canal within the EAA. For this alternative, A-1 North Reservoir, and A-2 Reservoir outflows can be sent to the new A-1 South STA, to the existing STA-2, and/or to the existing STA-3/4. Outflows from the A-1 South STA would be conveyed to the Miami Canal south of the existing G-373 divide structure via a new east-west A-1 South STA outflow canal located adjacent to and directly south of the A-2 Reservoir. A-1 North Reservoir outflows can be conveyed to the North New River Canal via a reservoir outflow structure and A-2 Reservoir outflows can be conveyed to the Miami Canal via a reservoir outflow structure.

Alternative R360D does not include an intake canal along the north boundary of the project area and instead includes two inflow pump stations, one located at the northeast corner of the A-1 North Reservoir that would convey water from North New River Canal and one located at the northwest corner of the A-2 Reservoir that would convey water from the Miami Canal. Having separate inflow pump stations allows flexibility to convey water into the A-1 North Reservoir and A-2 Reservoir from either side of the project area.

3.5.5 Alternative C360C

Alternative C360C includes the exact same storage, treatment, and conveyance improvements and related infrastructure as Alternative R360C above (**Section 3.5.3**). However, Alternative C360C includes additional operational flexibility and can serve multiple purposes including environmental benefits and other water related needs as identified in Component G of the CERP.

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4.0 EVALUATION AND COMPARISON OF ALTERNATIVE PLANS

The array of alternatives developed and presented in **Section 3** were compared using the Principles and Guidelines criteria (Completeness, Acceptability, Efficiency, and Effectiveness). Project benefits were quantified using project-specific performance measures, planning level costs were calculated for each alternative plan, and an analysis was conducted using Cost Effectiveness and Incremental Cost Analysis (CE/ICA) to identify alternatives that maximize environmental benefits compared to costs. The alternatives were also compared using the system of accounts (National Economic Development [NED], Environmental Quality [EQ], Regional Economic Development [RED], and Other Social Effects). Further, the environmental impacts on the natural and human environment were evaluated and considered for the array of alternatives consistent with NEPA, and those impacts are presented in **Section 5.** This evaluation and comparison among the alternatives enabled the SFWMD team to identify the Tentatively Selected Plan (TSP), which would be equivalent to the National Ecosystem Restoration (NER) plan in USACE water resource planning guidance.

4.1 PRINCIPLES AND GUIDELINES EVALUATION CRITERIA

Principles and Guidelines criteria:

- **Effectiveness:** Extent to which an alternative plan alleviates the specified problems and achieves the specified opportunities (Evaluated in **Section 4.1.1**)
- **Acceptability:** Workability and viability of the alternative plan with respect to acceptance by State and local entities and the public and compatibility with existing laws, regulations, and public policies (Evaluated in **Section 4.1.2**)
- **Completeness:** Extent to which a given alternative plan provides and accounts for all necessary investments or other actions to ensure the realization of the planned effects (Evaluated in **Section 4.1.3**)
- **Efficiency:** CE/ICA identified plans that maximize environmental benefits compared to costs (Evaluated in **Section 4.2**)

4.1.1 Effectiveness

An effective alternative alleviates the specified problems and achieves the specified opportunities for the CERP approved by Congress in 2000. The CEPP, authorized by Congress in 2016, includes increments of CERP. The CEPP used the term “increment” to underscore the emphasis that the study had on formulating “scales” of CERP. The CEPP envisioned that later studies would investigate additional scales to ultimately achieve the level of restoration envisioned by CERP. This CEPP PACR assumes that CEPP is part of the FWO condition (e.g., authorized CEPP features have been constructed and are achieving the increment of restoration defined in the CEPP PIR). The CEPP PACR addresses an additional increment of restoration beyond CEPP to further reduce high-volume regulatory discharges from Lake Okeechobee to the Northern Estuaries and to achieve the target flows to the Greater Everglades envisioned by CERP. In the CEPP PACR, the longer duration high-flow discharge events that are most detrimental to estuarine species such as oysters and seagrasses would be reduced by 40% and 55% to the Caloosahatchee and St. Lucie Estuaries, respectively, in addition to the benefits provided by CEPP. As such, the CEPP problems and opportunities, including undesirable discharges to the Northern Estuaries and restoration of flows to the Greater

Everglades, drove the development of planning objectives for this CEPP PACR (see **Section 1** of the report). Effectiveness was evaluated by how well the alternatives would achieve the planning objectives. **Table 4-1** describes the performance measures used to determine the effect of alternatives and presents how each alternative performed with respect to each objective. A detailed description of the performance measures is provided in **Appendix G**. The performance measures were defined by the following zones used to capture the spatial extent of benefits:

- Zone St. Lucie Estuary includes 14,994 acres of estuarine habitat as the maximum area of potential improvement.
- Zone Caloosahatchee Estuary includes 70,979 acres of estuarine habitat as the maximum area of potential improvement.
- Zone 3A-MC was sized to capture the immediate hydrologic effects of the Miami Canal. Zone 3A-MC was also delineated to completely contain the Indicator Regions (IRs) adjacent to the Miami Canal.
- Zone 3A-NE is one of the most over-drained areas within northern WCA 3A and is severely degraded. Zone 3A-NE was sized to capture the hydrologic effects of a potential conveyance and distribution feature planned along the northeastern boundary of WCA 3A.
- Zone 3A-NW is also over-drained and severely degraded. Zone 3A-NW was sized to capture the hydrologic effects of a potential conveyance and distribution feature planned along the northwestern boundary of WCA 3A.
- Zone 3A-C was delineated to represent an area of WCA 3A with a relatively well-conserved ridge and slough landscape.
- Zone 3A-S was delineated to represent an area of WCA 3A that has been impacted by impoundment structures. The southern portion of WCA 3A is primarily affected by high water and prolonged periods of inundation. The line delineating Zone 3A-C from Zone 3A-S was selected to be parallel to the Miami Canal to maintain a boundary roughly equidistant from the Miami Canal and be roughly midway between the Zone 3A-NW boundary and Tamiami Trail.
- Zone 3B was delineated to represent an area hydrologically isolated from the project by levees. Zone 3B was delineated to determine hydrologic benefits of the project to WCA 3B.
- Zone ENP-N was delineated to completely contain IRs 129 (Northeast Shark River Slough) and 140 (Lostman's Slough) located south of WCA 3A. The boundary of Zone ENP-N was also delineated to reach the southern extent of the L-67 Extension located in ENP.
- Zone ENP-S was delineated to capture mid, southwest and south Shark River Slough in Everglades National Park.
- Zone ENP-SE was delineated to capture Taylor Slough in ENP and reach the southern extent of ENP.

Additional details on hydrologic and ecological performance of the CEPP PACR alternatives can be found in **Section 5.1, Appendix C.2.1**, **Appendix A,** and **Appendix G**.

Table 4-1. Summary Comparison of Alternatives in Effectiveness

Future Without (FWO) Project Condition	Alt R240A Alt R240B	Alt R360C Alt R360D	Alt C360C
Objective: Provide additional freshwater flows to the central Everglades; Restore seasonal hydroperiods and freshwater distribution to support a natural mosaic of wetland and upland habitat in the Everglades System.			
Ridge and slough is the most common habitat in the central Everglades. The slough vegetation performance measure (PM) provides a measure of the suitability of hydrologic conditions for two key species of slough vegetation. Hydrologic conditions that support a more natural habitat mosaic generally improve for all the alternatives. The hydroperiod (PM 5.1) increases in all alternatives and all areas (Zones 3A-MC [Alts R360C, R360D, and C360C], 3A-NE, 3B, ENP-N, ENP-S, and ENP-SE), except Zone 3A-NW where conditions decrease slightly and Zone 3A-C, 3A-S, and in Alts R240A and R240B of Zone 3A-MC where conditions do not change from the FWO. Improvement would be expected from the FWO in all other slough vegetation measures (PM 5.2, 5.3, and 5.4 – drydown and dry and wet season depth), except drydown in 3A-S, ENP-N, and ENP-S would be expected to be the same as the FWO and Alts R240A and R240B in ENP-SE would be expected to decrease slightly. In CEPP, the degree of freshwater distribution varied depending on the spatial extent and location of distribution features. The alternatives considered in this study cover the same spatial extent and provide an increase in freshwater flows during the dry season. PM scores for slough vegetation by zone can be found in **Appendix G Tables G-6** through **G-8** and **G-11** through **G-16**.			
Change from FWO (Performance Measure for Slough Vegetation)			
	PM 5.1: -2 to 3; PM 5.2: -3 to 2; PM 5.3: 0 to 3; PM 5.4: 1 to 3	PM 5.1: -1 to 3; PM 5.2: 0 to 3; PM 5.3: 0 to 3; PM 5.4: 1 to 4	PM 5.1: -1 to 3; PM 5.2: 0 to 3; PM 5.3: 0 to 3; PM 5.4: 1 to 4
Objective: Provide additional freshwater flows to the central Everglades; Improve sheetflow patterns and surface water depths/durations in the Everglades in order to reduce soil subsidence, frequency of damaging peat fires, decline of tree islands, and salt water intrusion.			
Before drainage, the Everglades probably remained wet nearly all years, with minimum slough water levels remaining at 0.5 to 1.0 feet (ft) above ground. Peat cores reveal little evidence of major fires. The Central and Southern Florida (C&SF) Project substantially altered hydrology. Construction of the Miami, North New River and Hillsboro Canals substantially lowered water levels, drying out the peat, reducing soil accretion, and increasing soil loss through oxidation and severe peat fires. Each alternative includes increases to sheetflow timing (PM 2.1) and continuity (PM 2.2) across the WCA 3A via hydropattern restoration. Alternatives additionally improve surface water depths and durations (PM 1.1) in Zones 3A-NE, 3A-MC, and 3A-NW through the introduction of additional water made available by the reservoir and the redistribution of stormwater treatment area (STA) 2 discharges. Similar to CEPP providing additional flows will help mitigate the effects of salt water intrusion. All alternatives further reduce the risk of soil oxidation (PM 3.1) and peat fires relative to the FWO. All alternatives perform similarly to each other. Alternatives reduce risk of soil oxidation and fire more in Zones 3A-MC and 3A-NW than in the other zones. PM scores for slough vegetation by zone can be found in **Appendix G Tables G-6** through **G-16**.			
Change from FWO (Performance measure for Soil Oxidation)			
	PM 3.1: 0 to 3	PM 3.1: 0 to 4	PM 3.1: 0 to 4

Table 4-1. Summary Comparison of Alternatives in Effectiveness (continued)

<table>
<tr><th>Future Without (FWO) Project Condition</th><th>Alt R240A
Alt R240B</th><th>Alt R360C
Alt R360D</th><th>Alt C360C</th></tr>
<tr><td colspan="4">Objective: Reduce Lake Okeechobee damaging discharges to the Northern Estuaries; Improve the quality of oyster and submerged aquatic vegetation (SAV) habitat in the Northern Estuaries (St. Lucie Estuary [SLE] and Caloosahatchee Estuary [CE]).</td></tr>
<tr><td colspan="4">High volume discharges from Lake Okeechobee can result in rapid decreases in salinity. Sustained exposure to reduced salinity produces adverse effects on oyster reefs, juvenile marine fish, sea grass beds, and other submerged aquatic vegetation in the Northern Estuaries. Reducing the frequency and magnitude of the high-volume discharges improves salinity conditions in these estuaries thereby improving the quality of oyster and SAV habitat.
All alternatives reduce high-volume discharges to the Northern Estuaries. The CEPP alternatives reduce the moderately high lake inflow and estuary discharge events while the CEPP PACR alternatives can manage the extremely high and longer duration lake inflows by diverting larger flows to the south, to the storage and treatment facilities, and reducing flows that would have otherwise gone to the estuaries. The CEPP PACR alternatives go a long way at improving estuary health and resiliency by reducing the frequency of extreme high flows lasting more than 42 days to the SLE by 55%. In the CE, the high flows lasting more than 60 days were reduced by 40%. When the CEPP PACR is combined with all other authorized projects, the total volume of water released from Lake Okeechobee to the Northern Estuaries is reduced by 55% and the number of high-flow discharge events are reduced by 63%. These reductions will improve salinity conditions in the estuary by reducing the number of LO events that exceed the preferred salinity envelope by 39% in the SLE and 45% in the CE.</td></tr>
<tr><td colspan="4">(Number of months of high flow and of extreme high flows, fewer is better)— High flows for St. Lucie Estuary (SLE) are represented by mean monthly flow between 2000 and 3000 cubic feet per second (cfs) and Caloosahatchee Estuary (CE) high flows are mean monthly flows > 2800 cfs. Extreme high flows for SLE are mean monthly flows greater than 3000 cfs and for CE are mean monthly flow > 4500 cfs.</td></tr>
<tr><td>High flows:
SLE – 32 months;
CE – 70 months
Extreme high flows:
SLE – 24 months;
CE – 29 months</td><td>High flows:
SLE – 28 months;
CE – 64 months
Extreme high flows:
SLE – 23 months;
CE – 28 months</td><td>High flows:
SLE – 26 months;
CE – 63 months
Extreme high flows:
SLE – 22 months;
CE – 29 months</td><td>High flows:
SLE – 28 months;
CE – 61 months
Extreme high flows:
SLE – 22 months;
CE – 28 months</td></tr>
<tr><td colspan="4">Objective: Provide additional freshwater flows to the central Everglades; Restore more natural water level responses to rainfall to promote plant and animal diversity and habitat function.</td></tr>
<tr><td colspan="4">The target dry season recession rate in WCA 3A is approximately 0.05 ft per week from January 1 to June 1 (or onset of the wet season). This equates to a net stage difference of approximately 1.0 ft. Recession rates that are too slow prevent the gradual concentration of small fish and amphibian prey species into smaller, higher concentration areas where wading birds and other predators can catch them – the fish and other prey stay widely dispersed. Recession rates that are too fast lead to dry downs before the end of the dry season and eliminate the small fish and amphibians prey base. Rapid recession rates also may harm vegetation communities which are critical to nesting success of several bird species.
All alternatives performed better than the FWO, with more weeks in the target and moderate recession rate zones, and fewer weeks in the lowest zone (recession rate too fast or too slow). All alternatives performed similar to each other.</td></tr>
<tr><td colspan="4">(Dry season recession rate in WCA 3A (strive for 0.05 ft/week from Jan 1 to Jun 1)).</td></tr>
<tr><td>140 of 880 weeks within 0.05 of target rate</td><td>147 of 880 weeks within 0.05 of target rate</td><td>144 of 880 weeks within 0.05 of target rate</td><td>147 of 880 weeks within 0.05 of target rate</td></tr>
</table>

Table 4-1. Summary Comparison of Alternatives in Effectiveness of Meeting the Planning Objectives of CEPP PACR (continued)

Future Without (FWO) Project Condition	Alt R240A Alt R240B	Alt R360C Alt R360D	Alt C360C
Objective: Increase availability of **water supply**.			
Constraint: Ensure plan does not impact existing legal users water supply availability.			
The purpose of the Comprehensive Everglades Restoration Program (CERP), CEPP, and CEPP PACR is to restore, preserve, and protect the south Florida ecosystem while providing for other water-related needs of the region. There is also a legal requirement to evaluate impacts on legal water users and provide replacement sources of water of comparable quantity and quality if any adverse impacts are identified. The alternatives had less water supply cutback volumes than the FWO during the 8 years with the highest water supply cutback volumes.			

The CEPP plan was the first incremental step in increasing average annual flows to the central Everglades. This first increment of the CEPP provided approximately 210,000 ac-ft of flow on an average annual basis to the central Everglades, which is approximately two-thirds of the CERP performance goal.

Screening efforts in plan formulation for the CEPP PACR utilized the CERP Goal and attempted to deliver the remaining one-third of new water essential to Everglades restoration consistent with the CERP performance goal.

Early screening outcomes identified a high potential for this project to meet or exceed the CERP Goals in sending water to the central Everglades. The screening analysis compared the Pre-CERP Baseline (USACE 2005) with the CERPA scenario, the updated model scenario from the RECOVER 2005 Initial CERP Update effort (RECOVER 2005), to establish the CERP Goal for flow to the central portion of the Everglades. This analysis identified the CERP Goal flow target of approximately 300,000 ac-ft of new water on an average annual basis over the 36-year modeled simulation period (1965-2000) available from RECOVER. This CERP Goal flow target, based on a 36-year period of record, became the updated target for continued plan formulation work. **Figures 4-1 through 4-5** utilize the 36-year period of record from CERP as identified above to illustrate how the array of alternatives work with previously authorized plans to achieve the restoration goals of CERP. Alternatives R240A and R240B would each achieve approximately 89% of the CERP goal for flow to the central Everglades, Alternatives R360C and R360D would each achieve approximately 91% of the CERP goal, and C360C would achieve approximately 94% of the CERP goal.

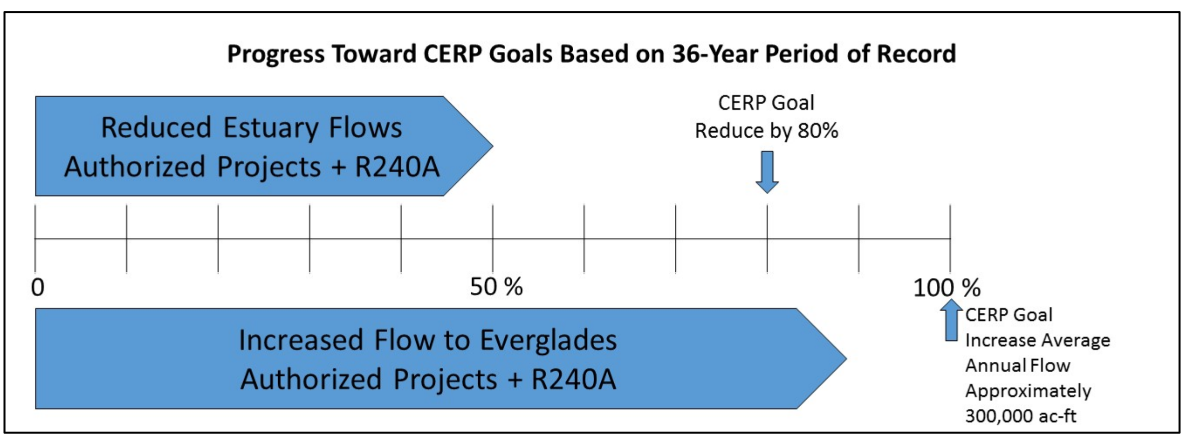

Figure 4-1. Progress toward Meeting CERP Restoration Goals with Alternative R240A

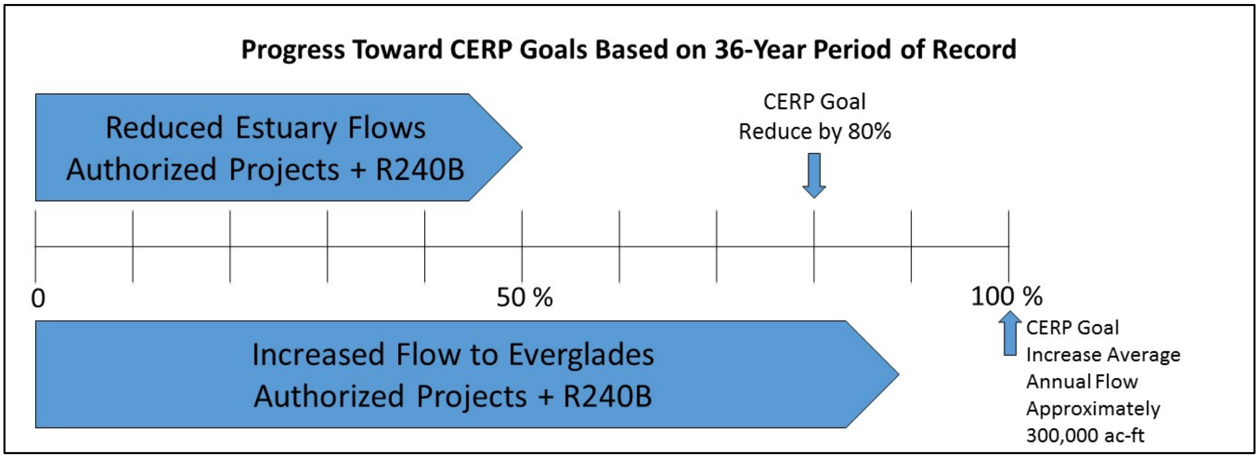

Figure 4-2. Progress toward Meeting CERP Restoration Goals with Alternative R240B

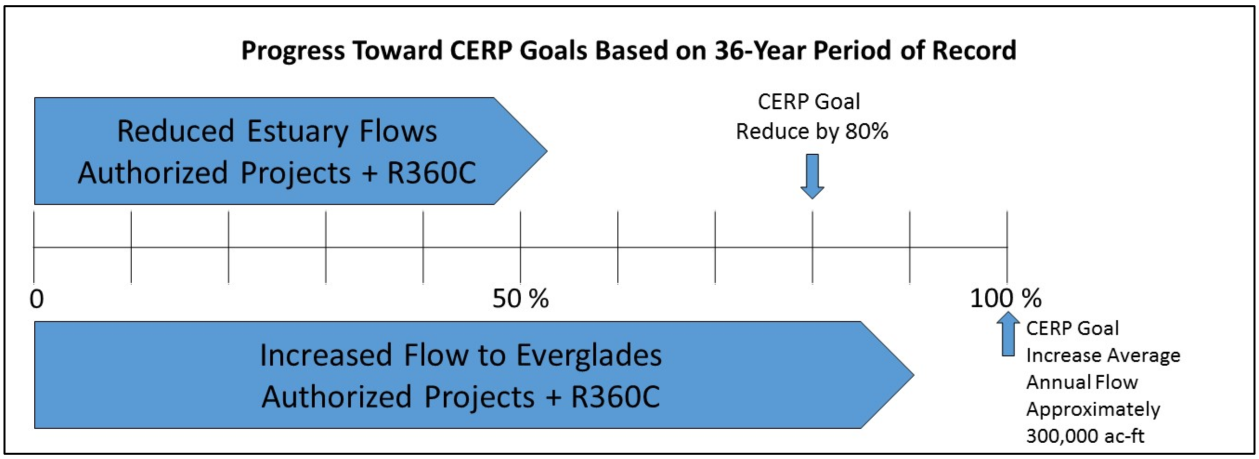

Figure 4-3. Progress toward Meeting CERP Restoration Goals with Alternative R360C

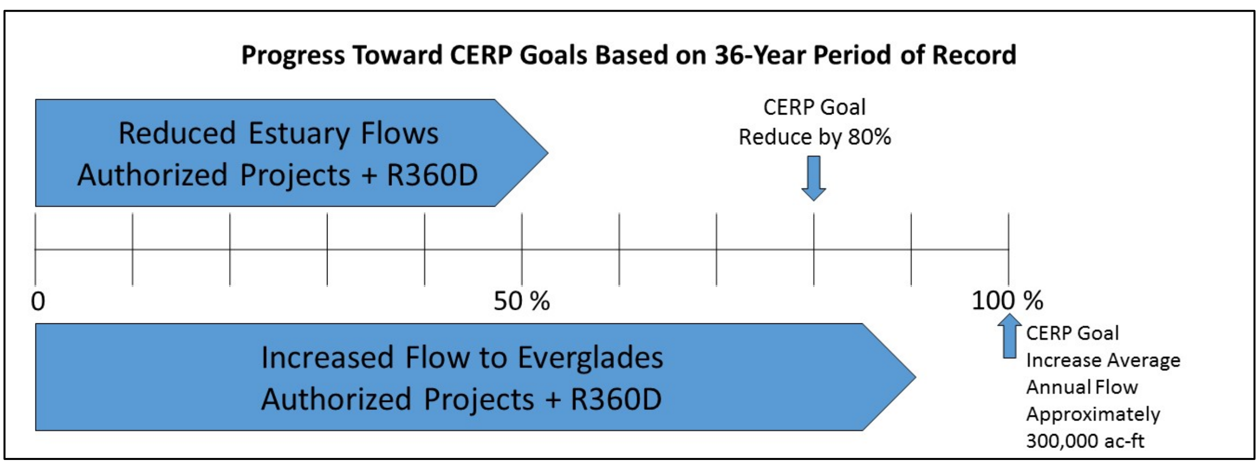

Figure 4-4. Progress toward Meeting CERP Restoration Goals with Alternative R360D

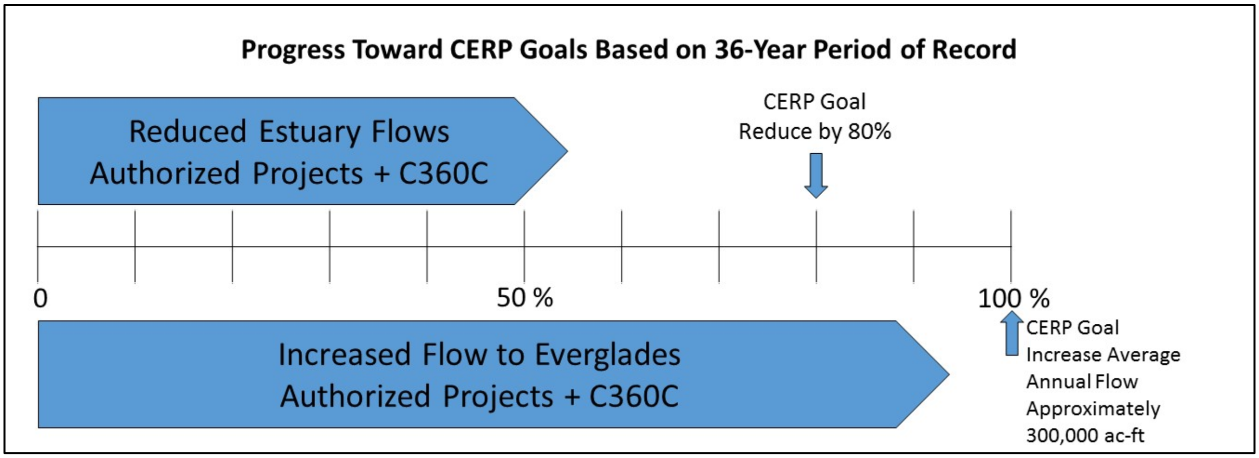

Figure 4-5. Progress toward Meeting CERP Restoration Goals with Alternative C360C

4.1.2 Acceptability

An acceptable alternative plan is workable and viable with respect to acceptance by Federal, State, and local entities and the public, and is compatible with existing laws, regulations, and public policies. There are several State and Federal laws, and other considerations, that must be addressed in order to obtain the necessary approvals in the evaluation and comparison of alternative plans and selection of the TSP. The CEPP PACR will comply with the requirements of Federal and Florida State law including the WRDA 2000, and Section 373.1501 F.S. and Section 373.4598 F.S., among others, to ensure project completeness by providing and accounting for actions of Federal and non-Federal entities. **Table 4-2** presents a description of specific public and stakeholder concerns that have been raised regarding acceptability.

Table 4-2. Public and Stakeholder Acceptability

Costs
Desire to recognize economic impacts beyond USACE cost effectiveness/incremental cost analysis to justify project benefits (e.g., fishing, tourism, and carbon sequestration). Concerns regarding high cost of deep storage versus shallow storage.
Estuary Benefits
Configure project components and operations to maximize mitigation of harmful discharges to estuaries. EAA Reservoir will not do enough to mitigate harmful discharges. Public feedback that additional planning efforts are needed beyond the scope of CEPP and the CEPP PACR to further reduce discharges such as storage north of the lake.
Land
Finding a balance between additional land needed to lower the costs and risks for storage and treatment, as well as the efficacy of removing additional prime and unique farmland from agricultural production and the effects it would have on the agricultural industry and economy.
Schedule
A general consensus that mitigating harmful discharges to the estuaries is an immediate need. Desire to expedite the completion of project planning, design, and construction of the project features.
Water Quality Treatment
Concerns that additional STAs are needed to sufficiently treat water. Concerns that the 360,000 ac-ft storage alternatives will impact the existing A-1 FEB. Concerns that additional water quality parameters beyond phosphorus should be analyzed. Increased flows across the Red line are needed for ENP and Florida Bay.

Table 4-2. Public and Stakeholder Acceptability (continued)

Conveyance
Provide greater conveyance south of Lake Okeechobee as historically experienced to reduce flows to estuaries and increase flows to Everglades and Florida Bay.
Recreation
Provide deep-water refugia to support fish and wildlife during dry periods. Provide recreational access and opportunities for the community. Limit closures of WCA 3A to public access for hunting.

Some of the stakeholder concerns listed in **Table 4-2**, such as interpretations of Section 373.4598 F.S. and the desire to include additional analyses that were not consistent with those performed for the CEPP PIR are legal and policy concerns. There were similar levels of acceptability among the different alternatives with the notable exception of some preference for the R240A and R240B alternatives based on concerns that the existing A-1 FEB should remain in place.

Several real estate actions were also taken to facilitate planning for the CEPP PACR. Section 373.4598 F.S. required that real estate actions include the pursuit of willing sellers, termination of leases on State lands, and land exchanges. The SFWMD fulfilled these requirements, while maximizing the use of previously acquired land already in public ownership and adjacent to existing infrastructure. The SFWMD would acquire the privately held lands from both of the landowners in the western lands between the A-2 parcel and the Miami Canal. All SFWMD leaseholders located within the EAA have been notified that their leases will be terminated in accordance with lease terms. The FDEP has been notified that State lands between the A-2 parcel and the Miami Canal will be needed for the project. As willing landowners are successfully identified within this planning process, the SFWMD will work to exchange State-owned lands for private lands, as long as they can be used effectively in conjunction with existing facilities.

4.1.3 Completeness

A complete alternative plan provides and accounts for all necessary investments or other actions to ensure the realization of the plan's effects. All CEPP PACR alternatives provide a similar level of completeness. All alternative project features in the CEPP PACR are dependent on the components of CEPP including the modification of C&SF System components in the southern end of the system. Components of the Everglades are hydrologically connected from Lake Okeechobee to Florida Bay, and rely on one another for both inflows and outflows. These interdependencies required system-wide plan formulation from a spatial perspective to optimize structural and operational components, rather than formulating separable components that may not be compatible or complete for the cumulative watershed. For CEPP, in order to maintain completeness and meet constraints during construction, a strategic implementation sequencing and adaptive management plan was required. Similarly, the operation of project components (storage reservoir and STA) in the CEPP PACR have interdependencies with other projects including the future CEPP PPA North and CEPP PPA South features that are required to fully achieve the operation intent and ecosystem benefits of the project.

These interdependencies are discussed in more detail in **Section 6.7**.

4.2 EFFICIENCY ANALYSIS: ENVIRONMENTAL BENEFITS AND COSTS OF ALTERNATIVE PLANS

The CEPP PACR TSP is justified both by the reduction in high-volume regulatory discharges from Lake Okeechobee to the Northern Estuaries and a corresponding increase in flows to the south of the EAA to efficiently produce additional environmental benefits to the south Florida ecosystem consistent with CERP Goals. The measurement of efficiency is the extent to which an alternative plan is the most cost-effective means of alleviating the specified problems and realizing the specified opportunities, consistent with protecting the nation's environment.

The CE/ICA is used to evaluate and compare the production efficiency of alternatives. This identifies the plans that reasonably maximize ecosystem restoration, a key criterion to select the TSP (equivalent to the NER plan in USACE water resource planning guidance). Cost effectiveness analysis begins with a comparison of the costs and outputs of alternative plans to identify the least cost plan for every level of output considered. Alternative plans are compared to identify those that would produce greater levels of output at the same cost or lesser cost than other alternative plans. Alternative plans identified through this comparison are the cost-effective alternative plans. Cost-effective plans are then compared by examining the additional (incremental) costs for the additional (incremental) amounts of output produced by successively larger cost-effective plans. The plans with the lowest incremental costs per unit of output for successively larger levels of output are the best buy plans. The results of these calculations and comparisons of costs and outputs between alternative plans provide a basis for addressing the decision question "Is it worth it?" i.e., are the additional outputs worth the costs incurred to achieve them?

The CE/ICA analysis follows guidance from the USACE ER 1105-2-100, Appendix E, para. E-36. Costs are based initially on a planning level estimate and benefits are based on the habitat unit (HU) evaluation. As per this guidance, CE/ICA analysis compares the alternative plans' average annual costs against the appropriate average annual HU estimates. The average annual outputs are calculated as the difference between with-plan and without-plan conditions over the period of analysis (through year 2076).

4.2.1 Costs of Array of Alternative Plans

Costs represent the difference between conditions without any plan (the "base condition" or "without project condition") and with a plan or alternative. For purposes of this report and analysis, National Economic Development costs (as defined by Federal and USACE policy) are expressed in 2018 price levels. Costs of a plan represent the value of goods and services required to implement and operate/maintain the plan. The cost estimate for the alternatives includes construction; lands, easements, right-of-ways, and relocation (LERR); PED; construction management; and operations, maintenance, repair, rehabilitation, and replacement (OMRR&R). Costs were developed through engineering design and cost estimation, and real estate appraisal efforts.

4.2.1.1 Overview of the Planning Level Cost Estimating Tool

Rough order of magnitude (ROM) costs were developed for each alternative using best professional judgment by the SFWMD, gained through previous work in the EAA, to enable a "Planning Level" Construction Cost Estimate for reservoirs, STAs, and canals. The construction costs included in the planning level estimate include PED, engineering during construction (EDC), and construction management supervision and administration (S&A).

The ROM costs are screening level relative costs, not absolute costs. These costs should only be used to compare the costs of alternatives relative to one another and are not to be used as the detailed costs for construction. These costs were developed using historical costs from SFWMD constructed projects. The previously developed Planning Level Cost Estimating Tool was not applied here because it has not been updated based on experience gained from construction projects over the past five years. Instead, SFWMD actual construction costs were used to estimate unit costs for all the alternatives.

The costs of the FWO were escalated to FY18 dollars for comparison with the alternatives considered in the CEPP PACR. The original costs developed for the authorized CEPP project, the FWO in this study, included an FEB on the A-2 parcel. All the CEPP PACR alternatives would change the authorized CEPP A-2 FEB to an above-ground storage reservoir, and the 360,000 ac-ft storage alternatives would convert the A-1 FEB to a combination of an above-ground storage reservoir and STA. The final costs presented in CEPP were escalated to FY18 dollars, the costs for the A-2 FEB were removed, and costs were updated based on the proposed design on each new alternative. These updated CEPP PACR ROM costs were then compared with the originally authorized CEPP as the FWO.

4.2.1.2 Overview of Real Estate Costs

A detailed analysis of the real estate requirements of the array of alternatives was completed (**Appendix D**). Each parcel required for construction or restoration activities was identified, characterized, and a value estimate was assumed to be $41,135,000.

The alternatives had land requirements for the storage and treatment features. Lands for the A-1 (16,557 acres) and A-2 (13,825 acres) parcels are currently owned by the SFWMD. An additional 4,155 acres for the A-2 Expansion area will also be required. These lands were valued at an estimated fair market value.

4.2.1.3 Average Annual Costs

The timing of a plan's costs is important. Construction and other implementation costs cannot simply be added to periodically recurring costs for project operation, maintenance, and monitoring if meaningful and direct comparisons of the costs of the different alternatives are to be made. A common practice of equating sums of money across time with their equivalent at an earlier time is the process known as discounting. Through this mathematical process, which involves the use of an interest rate (or discount rate) officially prescribed by Federal policy for use in water resource planning analysis (set at 2.75% at the time of the evaluation), the cost time streams for the alternative plans were mathematically translated into an equivalent time basis value. There is some uncertainty as to how any of the alternatives would be implemented. It is recognized that any of the plans would likely be implemented over a considerable length of time. For purposes of this evaluation, construction costs are assumed to incur on an equal monthly basis during the implementation of the alternative plans and would be implemented with no fiscal appropriation constraints.

ER 1105-2-100 requires that interest during construction (IDC) be computed, which represents the opportunity cost of capital incurred during the construction period. IDC was computed for PED costs from the middle of the month in which the expenditures were incurred until the first of the month following the estimated construction completion date, and assumed a 5-year unconstrained construction timeline. IDC was computed for both real estate and construction costs. IDC was computed for the total real estate cost starting from the month prior to construction commencing. The total first cost is the sum of construction and other capital cost, such as real estate and pre-construction. The total project investment is the first cost plus IDC. **Table 4-3** summarizes the total investment cost and average annual costs of each alternative plan.

Table 4-3. Planning Level Construction and Investment Cost of Alternative Plans

Item Description	FWO	R240A	R240B	R360C	R360D	C360C
Authorized CEPP Construction and Implementation	$ 1,991,659,000	$ 1,991,659,000	$ 1,991,659,000	$ 1,991,659,000	$ 1,991,659,000	$ 1,991,659,000
Alternative Construction & Implementation (EAA Reservoir)		$ 1,737,273,387	$ 1,755,727,044	$ 2,108,489,398	$ 2,107,108,102	$ 2,108,489,398
Costs Removed from CEPP (for removal of A-2 FEB)	$ -	($ 399,219,000)	($ 399,219,000)	($ 399,219,000)	($ 399,219,000)	($ 399,219,000)
Total Project Construction & Implementation	$ 1,991,659,000	$ 3,329,713,387	$ 3,348,167,044	$ 3,700,929,398	$ 3,699,548,102	$ 3,700,929,398
Construction Duration (Mo.)	60	60	60	60	60	60
Interest During Construction	$ 138,987,700	$ 232,363,700	$ 233,651,500	$ 258,269,000	$ 258,172,600	$ 258,269,000
Project Lands and Damages	$ 38,825,000	$ 38,825,000	$ 38,825,000	$ 38,825,000	$ 38,825,000	$ 38,825,000
Total Construction, IDC and Lands & Damages	$ 2,169,471,700	$ 3,600,902,087	$ 3,620,643,544	$ 3,998,023,398	$ 3,996,545,702	$ 3,998,023,398
Average Annual Cost	$ 80,359,200	$ 133,380,700	$ 134,112,000	$ 148,090,500	$ 148,035,700	$ 148,090,500
STA Annual O&M Cost	$ -	$ 1,932,000	$ 2,940,000	$ 2,175,000	$ 2,644,000	$ 2,175,000
RESERVOIR Annual O&M Cost	$ -	$ 2,829,000	$ 2,754,000	$ 3,193,000	$ 3,665,000	$ 3,193,000
CEPP O&M	$ 6,781,000	$ 6,781,000	$ 6,781,000	$ 6,781,000	$ 6,781,000	$ 6,781,000
CEPP O&M Removed from Alternatives	$ -	$ 1,359,221	$ 1,359,221	$ 1,359,221	$ 1,359,221	$ 1,359,221
Average Annual O&M Cost	$ 6,781,000	$ 10,182,779	$ 11,115,779	$ 10,789,779	$ 11,730,779	$ 10,789,779
Total Average Annual Costs	**$ 87,140,200**	**$ 143,563,479**	**$ 145,227,779**	**$ 158,880,279**	**$ 159,766,479**	**$ 158,880,279**

*Annual costs are based on a 50-year period of analysis. Costs do not include costs of recreation features.
*Costs are planning level costs and do not coincide exactly with the detailed costs of the Tentatively Selected Plan presented in other sections of the report.
*Computation of the detailed estimate for the Tentatively Selected Plan is based on additional engineering and design.
*Contingency used in planning level costs was 20% due to the high level of uncertainty in the design of alternatives.

4.2.2 Ecological Evaluation (Habitat Units)

The CEPP devised a project-specific tool, referred to as the CEPP Planning Model, to evaluate alternatives within the CEPP project area. The primary areas evaluated included the St. Lucie River and Estuary and a portion of the Southern Indian River Lagoon and the Caloosahatchee River and Estuary and a portion of San Carlos Bay, WCAs 3A and 3B, ENP, and Florida Bay. HUs were not calculated for Lake Okeechobee or Biscayne Bay, since the performance of these areas were considered a constraint during formulation of CEPP. The CEPP Planning Model is a Microsoft Excel® spreadsheet that utilizes project performance measures to derive a HU score that represents the ecological performance achieved by each alternative. The complete description of the model, equations, and calculations, and further information pertaining to the alternative evaluation is provided in **Appendix G**.

The CEPP Planning Model was developed by the USACE Jacksonville District with support from multiple Federal and State agencies. Members of the CEPP Project Delivery Team (PDT) included subject matter experts on Everglades' flora and fauna, with extensive experience working in south Florida and Everglades' wetlands ecosystems. Members of the PDT also included ecologists, hydrologists, and planners from the USACE, United States Fish and Wildlife Service (USFWS), NPS, SFWMD, and FDEP. The CEPP Planning Model underwent peer review per Engineering Circular (EC) 1105-2-412 (Assuring Quality of Planning Models), 31 March 2011, and was recommended for single-use on CEPP by the USACE National Ecosystem Restoration Planning Center of Expertise on July 24, 2013. The HQUSACE (USACE Headquarters) Model Certification Panel approved the CEPP Planning Model on August 13, 2013. The CEPP Planning Model was applied in the same manner and without modification to the planning process for this CEPP PACR to maintain continuity with the approved use of the model for CEPP planning. Application of the model was subjected to an independent peer review process.

The CEPP Planning Model was used to aggregate the results of project performance measures for the CEPP PACR to compare with the FWO. Each of the performance measures for the CEPP planning effort was derived from those approved for use in CERP by REstoration COordination and VERification (RECOVER). Eight performance measures were identified (**Table 4-4**). Performance measures were developed from the Northern Estuaries, Greater Everglades Ridge and Slough, and Florida Bay Conceptual Ecological Models (CEMs) (Barnes 2005, Ogden 2005, Rudnick et al. 2005, Sime 2005). CEMs, as used in the Everglades restoration program, are non-quantitative planning tools that identify the major anthropogenic drivers and stressors on natural systems, the ecological effects of these stressors, and the best biological attributes or indicators of these ecological responses (Ogden et al. 2005). These CEMs have been extensively peer reviewed and provide the framework for the planning and assessment of the CERP. Each performance measure has a predictive metric and targets based on hydrologic requirements necessary to meet empirical or theoretical ecological thresholds. Detailed estimates of hydrology across the 41-year period of record (January 1965 – December 2005) generated by the RSM-BN (for the Northern Estuaries) and the RSM-GL (for the Greater Everglades [WCA 3 and ENP] and Florida Bay) were used to calculate performance measure scores.

Florida Bay HUs were calculated for the CEPP PACR utilizing the HU model and supporting the regression model developed and applied by ENP in CEPP. The changes in predicted Florida Bay salinity were calculated utilizing the regression relationship of water level stages in Taylor Slough, C-111 and Shark River Slough, and 17 monitoring stations in Florida Bay.

In order to calculate the comparable incremental change in HUs, the same tools were utilized for the CEPP PACR alternatives. Although it is recognized that these tools are imperfect in estimating actual ecological improvements in Florida Bay, mainly due to the differing acreages in the indicator regions, the tools do allow for the necessary comparison called for in the Federal planning process. Modeling results show that all of the alternatives provide a modest improvement (around 0.5 salinity units) to the bay. SFWMD scientists look at ecosystem responses to explain habitat improvement; however, HUs only allow for the comparison of alternatives. The interior of Florida Bay is dominated by a complex array of small islands and mud embankments. Circulation patterns in the bay have a strong influence on salinity, as exchanges of water between the basins are restricted by the mud embankments and the prevailing winds. The effect of small increases in surface water flow in Taylor Slough would have an influence in the nearshore area of northern Florida Bay.

Table 4-4. Performance Measures Used to Quantify Plan Benefits

Region	Performance Measure (PM)	Description
Northern Estuaries	**Caloosahatchee Estuary** • PM 6.1 Low Flow Targets • PM 6.2 High Flow Targets **St. Lucie Estuary** • PM 7.1 Low Flow Targets • PM 7.2 High flow Targets	Measure of the frequency of flows correlated to downstream estuarine salinities favorable to estuarine and marine fish, shellfish, oyster and SAV.
Greater Everglades (WCA 3 and ENP)	**Hydrologic Surrogate for Soil Oxidation** • PM 3.1 Drought Intensity Index	Measure of cumulative drought intensity as an indicator of peat oxidation and risk of fire.
	Inundation Duration: Ridge and Slough Landscape • PM 1.1 Percent Period of Record of Inundation	Measure of the frequency and duration of marsh inundation.
	Number and Duration of Dry Events: Shark River Slough • PM 4.1 Number of Dry Events • PM 4.2 Duration of Dry Events • PM 4.3 Percent Period of Record of Dry Events	Measure of the number of times and mean duration of periods when water levels drop below ground.
	Sheet Flow in the Ridge and Slough Landscape • PM 2.1 Timing of Sheetflow • PM 2.2 Continuity of Sheetflow • PM 2.3 Distribution of Sheetflow	Measure of the agreement of seasonal timing of flows with pre-drainage timing and of the spatial uniformity of sheet flow across the landscape.
	Slough Vegetation Suitability • PM 5.1 Hydroperiod • PM 5.2 Dry down • PM 5.3 Dry Season Depth • PM 5.4 Wet Season Depth	Measure of hydrologic conditions favorable to two species (white water lily and spikerush) indicative of Everglades sloughs.
Florida Bay	**Salinity in Florida Bay** • PM 8.1 Dry Season Regime Overlap • PM 8.2 Wet Season Regime Overlap • PM 8.3 Dry Season High Salinity • PM 8.4 Wet Season High Salinity	Measure of temporal-seasonal agreement between predicted salinity regimes in Florida Bay and pre-drainage salinity targets.

Performance measure scores are displayed as a function of restoration potential or achievement of the target with the minimum value of zero representing a fully degraded ecosystem and a maximum value of 100 representing the restoration target. Habitat suitability indices associated with each performance measure are then summed and applied to the total spatial extent (acres) for each of the 17 zones (**Figure 4-6** through **Figure 4-9**) to produce HUs. HU results for the ECB, the FWO project condition, and the alternatives are displayed in **Table 4-5**.

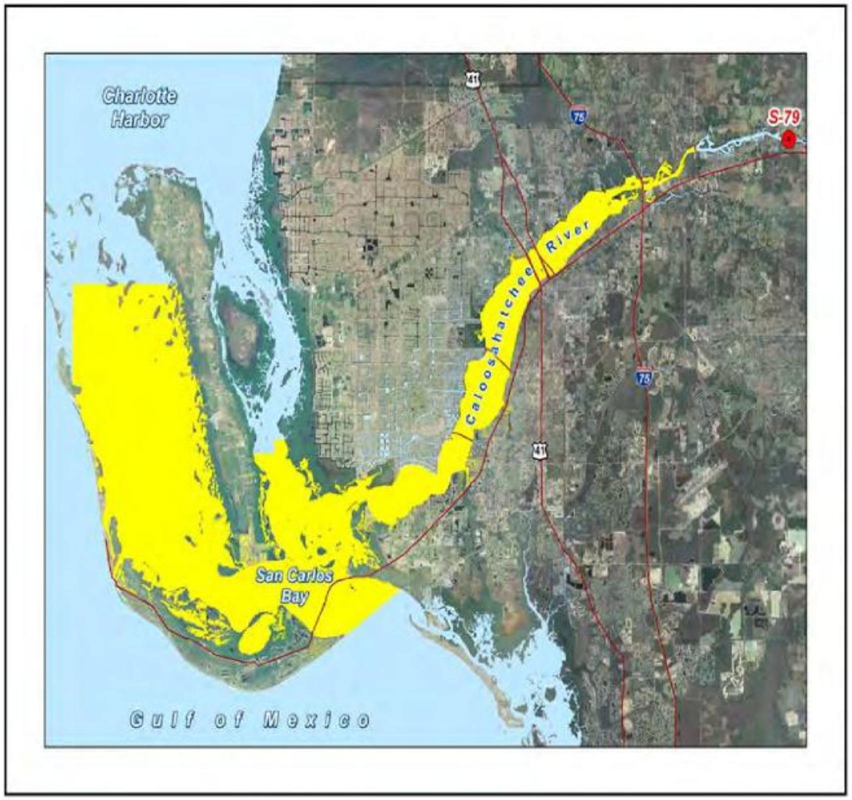

Figure 4-6. Zones for Habitat Suitability within the Caloosahatchee Estuary

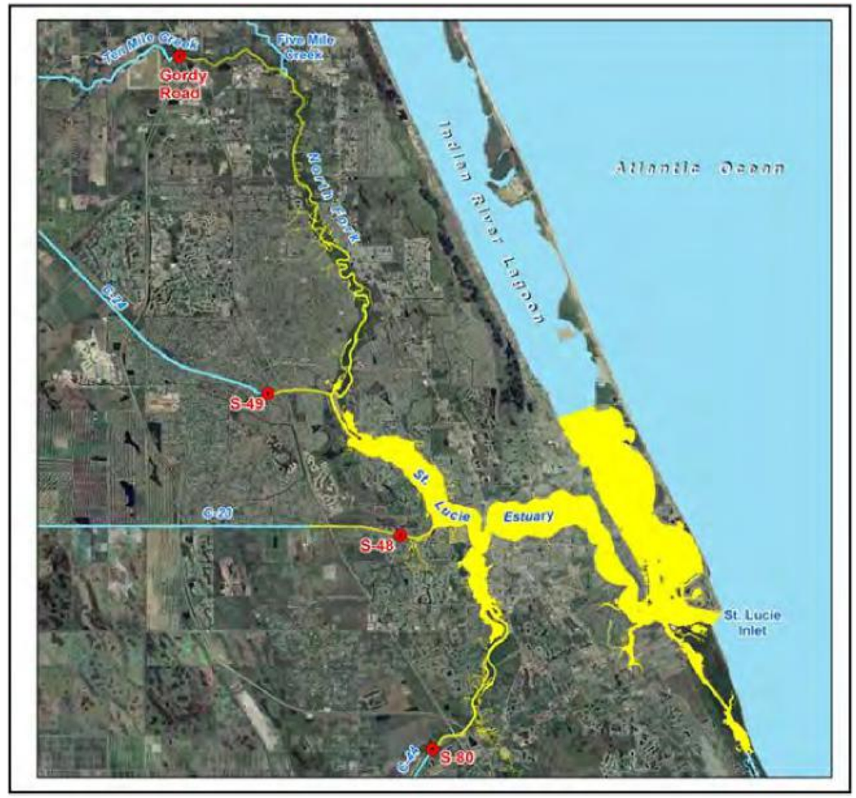

Figure 4-7. Zones for Habitat Suitability within the St. Lucie Estuary

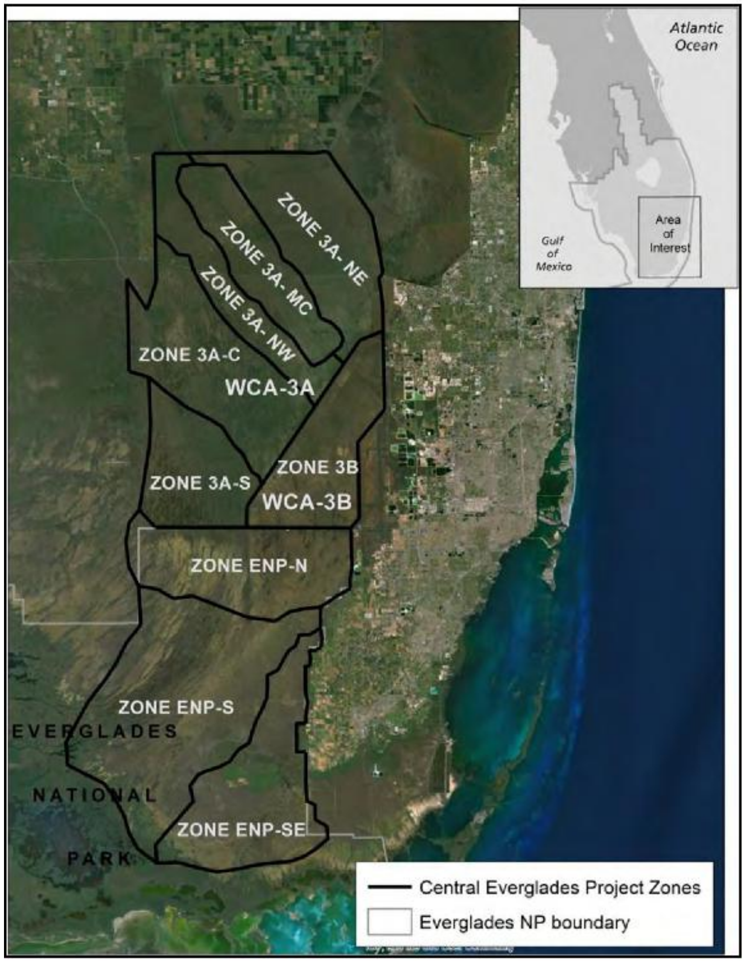

Figure 4-8. Zones for Habitat Suitability within WCA 3 and ENP

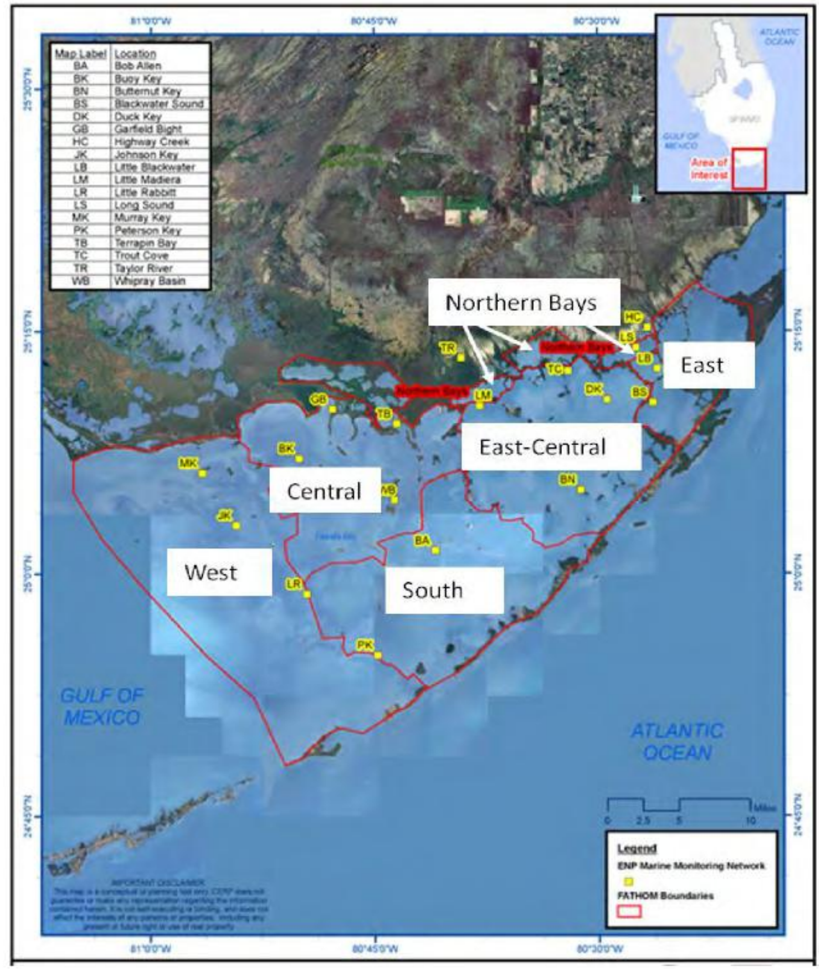

Figure 4-9. Zones for Habitat Suitability within Florida Bay

Table 4-5. Total Habitat Units for each Alternative Condition

Project Region (Zone)	ECB*	FWO**	Alt R240A Alt R240B**	Alt R360C Alt R360D**	Alt C360C**
Caloosahatchee Estuary (CE-1)	2,839	39,038	40,458	41,168	41,878
St Lucie Estuary (SE-1)	1,349	8,247	8,996	9,446	9,446
Total Northern Estuaries	**4,188**	**47,285**	**49,454**	**50,614**	**51,324**
Northeast WCA 3A (3A-NE)	44,451	91,372	92,606	92,606	92,606
WCA 3A Miami Canal (3A-MC)	32,847	54,746	56,310	56,310	56,310
Northwest WCA 3A (3A-NW)	30,970	54,198	55,606	55,606	55,606
Central WCA 3A (3A-C)	108,414	111,159	111,159	111,159	111,159
Southern WCA 3A (3A-S)	69,247	68,423	69,247	69,247	69,247
WCA 3B (3B)	55,697	59,125	59,982	59,982	59,982
Northern ENP (ENP-N)	57,557	97,596	100,098	100,098	100,098
Southern ENP (ENP-S)	124,068	169,400	171,786	174,172	174,172
Southeast ENP (ENP-SE)	79,711	83,764	83,764	83,764	83,764
Total Greater Everglades (WCA 3 and ENP)	**602,962**	**789,783**	**800,558**	**802,944**	**802,944**
Florida Bay West (FB-W)	23,700	41,100	44,200	44,200	44,200
Florida Bay Central (FB-C)	8,200	13,950	15,600	15,600	15,600
Florida Bay South (FB-S)	16,600	28,300	30,300	30,300	30,300
Florida Bay East Central (FB-EC)	22,000	34,300	36,100	36,900	36,900
Florida Bay North Bay (FB-NB)	2,150	2,660	2,790	2,790	2,790
Florida Bay East (FB-E)	9,060	9,820	10,200	10,200	10,200
Total Florida Bay	**81,710**	**130,130**	**139,190**	**139,990**	**139,990**
Total All Regions	**688,860**	**967,198**	**989,202**	**993,548**	**994,258**

* HU values for the ECB are consistent with CEPP.
** HU values for the FWO and alternatives are calculated for the full ecological response time.

Substantial benefits were attained through authorization of the CEPP. In the time since the CEPP planning effort, wetter than normal conditions have persisted in south Florida. These conditions have resulted in widespread public health impacts and extensive environmental harm to the aquatic ecosystem. As indicated previously, CEPP envisioned that later studies would investigate additional scales to ultimately achieve the level of restoration envisioned by CERP. The goal of the CEPP PACR is to achieve the remaining level of restoration envisioned by CERP and reduce undesirable high regulatory releases from Lake Okeechobee currently impacting the Northern Estuaries.

4.2.2.1 Average Annual Habitat Units

The average annual HU outputs were calculated as the difference between the with-plan and without plan conditions over the period of analysis (through year 2076). The base year for the period of economic analysis for CEPP PACR is the year 2026. The average annual HU lift is calculated by subtracting the FWO project HUs from the future with project HUs for each year and averaging over the 50-year period of analysis. The anticipated time it will take to realize the benefits is necessary to calculate the average annual lift associated with each alternative.

Natural ecosystems are complex, dynamic systems and the exact functional form of the relationship among variables is rarely if ever known. South Florida ecosystems have been subject to extensive research and monitoring, and credible estimates of response times can be predicted based on how key ecosystem components have responded to varying hydrologic conditions. The rate at which the CEPP PACR benefits accrue over various time intervals, depending on the region, was estimated using these inferences. Linear interpolation was used as a simple method for inferring the rate at which benefits would accrue between those time intervals for each of the three regions of the project area for both the FWO and future with project conditions.

Greater Everglades (WCA 3 and ENP)

CEPP estimated an ecological response time for the Greater Everglades based on the ability of the authorized plan to improve conditions for aquatic and herbaceous vegetation communities, periphyton, piscivorous fish, aquatic prey base organisms, and hydroecological reshaping of ridges and tree islands. The ecological response time of CEPP was estimated to be approximately 75-100 years until full impact would be realized, with a large percentage of benefits accruing earlier as identified in **Table 4-6**. The CEPP PACR assumes a similar response time in the Greater Everglades.

Table 4-6. Ecological Response Time for Greater Everglades (WCA 3 and ENP) (USACE 2014)

Percentage of Benefit Achieved Over Time for the Greater Everglades				
0-2 Years*	**2-5 Years**	**5-10 Years**	**25-50 Years**	**75-100 Years**
50%	70%	80%	90%	100%

*Base year is 2026

Florida Bay

CEPP estimated an ecological response time for Florida Bay based on the ability of the authorized plan to improve conditions for phytoplankton, zooplankton, seagrass, and large and small invertebrates. The ecological response time was estimated to be approximately 15-25 years until full impact would be realized, with a large percentage of benefits accruing earlier as identified in **Table 4-7**. The CEPP PACR assumes a similar response time in Florida Bay.

Table 4-7. Ecological Response Time for Florida Bay (USACE 2014)

Percentage of Benefits Achieved Over Time for Florida Bay				
0-2 years	**2-5 years**	**5-10 years**	**10-15 years**	**15-25 years**
40%	80%	90%	95%	100%

*Base year is 2026.

Northern Estuaries

An ecological response time for the Northern Estuaries was estimated based on the expected response time of oysters and submerged aquatic vegetation to improved salinities in CEPP. The ecological response time was estimated to be approximately 6 years until full impact would be realized. The expected response time of oysters and submerged aquatic vegetation would remain the same for the CEPP PACR.

Table 4-8 includes the average annual lift when taking into account the ecological response times of each of the three regions described above.

Table 4-8. Average Annual Habitat Unit Lift

	FWO	Alt R240A Alt R240B	Alt R360C Alt R360D	Alt C360C
St Lucie Estuary				
Average Annual Habitat Units	8,247	8,996	9,446	9,446
Average Annual Habitat Unit Lift		749	1,199	1,199
Caloosahatchee Estuary				
Average Annual Habitat Units	39,038	40,458	41,168	41,878
Average Annual Habitat Unit Lift		1,420	2,130	2,840
Greater Everglades (WCA 3 and ENP)				
Average Annual Habitat Units	789,783	800,558	802,944	802,944
Average Annual Habitat Unit Lift		10,775	13,161	13,161
Florida Bay				
Average Annual Habitat Units	130,130	139,190	139,990	139,990
Average Annual Habitat Unit Lift		9,060	9,860	9,860
Total Average Annual Habitat Unit Lift		**22,004**	**26,350**	**27,060**

The HU benefits associated with each CEPP PACR alternative (R240A, R240B, R360C, R360D, and C360C) in **Table 4-8** equal the net change in HUs from the FWO condition (including the Federally authorized CEPP in place). In the CEPP PIR, consideration of an above-ground storage reservoir, in lieu of an FEB, was determined to be cost excessive at that time. However, this alternative was reconsidered given the continuing and persistent threat during wet periods to the ecological integrity and economic conditions. The CEPP PACR goes further than CEPP to consider alternatives that will provide a more complete and effective plan to further reduce the frequency and duration of excessive regulatory releases to the Northern Estuaries while storing, treating, and distributing more of that water to the Greater Everglades ecosystem. The analysis in the CEPP PACR recognizes that the incremental cost of attaining the next increment of restoration benefits under CERP is likely to be substantially higher than previously authorized components of CEPP.

4.2.3 Cost Effectiveness Incremental Cost Analysis

The combined HU were used to ensure a cost-effective solution for CEPP. Consistent with CEPP, the CEPP PACR also combines HU scores for geographic areas to provide a valuable cumulative analysis for determining the plan that best meets the needs of the entire watershed.

4.2.3.1 Cost Effectiveness Incremental Cost Analysis – Total System-Wide Outputs

The CEPP PACR only considered the Total System-Wide outputs for the CE/ICA as can be seen in the following table (**Table 4-9**). The CE/ICA was performed using the USACE Institute for Water Resources (IWR) Plan on all five alternatives. Five alternatives were used as inputs since the different designs yield different costs though they are assumed to yield the same HU scores. Alternatives R240A and C360C are identified as being best buys for the aggregated system-wide HUs. Alternative R240B is more costly than R240A and Alternative R360D is more costly than R360C (or C360C). Alternatives R360C and C360C have the same design and therefore cost the same but are operated differently and yield different HUs. Therefore, Alternatives R240B and R360C are not cost effective for the production of system-wide HUs.

Table 4-9. Results of Cost Effectiveness Analysis for Total System-Wide Performance

Average Annual Cost	Alt R240A	Alt R240B	Alt R360C	Alt R360D	Alt C360C
Northern Estuaries	2,169	2,169	3,329	3,329	4,039
Greater Everglades (WCA 3 and ENP)	10,775	10,775	13,161	13,161	13,161
Florida Bay	9,060	9,060	9,860	9,860	9,860
Average Annual System Wide HUs	**22,004**	**22,004**	**26,350**	**26,350**	**27,060**
Average Annual Cost/Average Annual Habitat Units	**$2,564**	**$2,640**	**$2,723**	**$2,756**	**$2,651**
Cost Effective	**Yes**	No	No	No	**Yes**
Cost Effective/Best Buy	**Best Buy**				**Best Buy**

Notes: Habitat unit (HU) lift values for the Northern Estuaries, Greater Everglades, and Florida Bay for each alternative are the sum of the differences between FWO plan and plan on an average annual basis (see **Table 4-8**). Alternatives are arranged by increasing costs.

Alternative R240A is the best buy with the lowest cost per unit of habitat improvement ($2,564 average annual cost per average annual HU; **Table 4-9**). The second least cost alternative in terms of average cost per habitat improvement is Alternative C360C ($2,651 average annual cost per average annual HU; **Table 4-9**). Other alternatives (R240B, R360C and R360D) were not cost effective. Alternative C360C provides an incremental increase of 5,056 additional average annual HU lift over Alternative R240A with an incremental cost increase of $3,029 per HU lift and an incremental average annual cost increase of $15,316,800 more than the Alternative R240A incremental average annual cost of $56,423,279 (**Table 4-10**).

Table 4-10. Results of Incremental Cost Analysis

Alt.	Average Annual Cost	Change in Average Annual Cost from FWO	Average Annual Habitat Unit Lift	Cost Per Average Annual Habitat Units	Incremental Average Annual Cost Increase	Incremental Average Annual Habitat Unit Increase	Incremental Average Annual Cost/ Average Annual Habitat Unit
FWO	$87,140,200	$ -	0	$ -	$ -	0	$ -
R240A	$143,563,479	$56,423,279	22,004	$2,564	$56,423,279	22,004	$2,564
C360C	$158,880,279	$71,740,079	27,060	$2,651	$15,316,800	5,056	$3,029

4.2.3.2 Efficiency Analyses

Using the results of the system-wide CE/ICA analysis, a more detailed examination of alternative project components would:

- Provide logic and opportunity to modify alternatives to maximize benefits while minimizing costs
- Provide insights into the efficiency of specific components
- Identify information that would support selection of a more expensive but cost-effective plan (establish that the additional benefit is worth the additional cost)

All alternatives considered in the CEPP PACR would increase ecological benefits over those derived from the FWO. Overall, the system-wide benefits presented in **Table 4-9** would be realized due to the amount of water storage that would be available, and changes to Lake Okeechobee and water supply operations. The greatest benefits would be incurred by the operational efficiencies. Alternatives that store 360,000 ac-ft would be the most costly because of the impoundment structure. Alternatives with less storage would also have less infrastructure, and be less expensive to construct and operate, consequently incurring lower costs. Increasing storage from 240,000 ac-ft to 360,000 ac-ft increases the habitat benefits by about 20% and the costs by 27%. Specific benefits to the geographic areas are discussed in the following subsections.

Northern Estuaries

Increasing storage from 240,000 ac-ft to 360,000 ac-ft increases the HU lift for the Northern Estuaries from 2,169 for the R240 to 3,329 for the R360 compared to the FWO. Operational efficiencies associated with multiple purpose project operations would increase the HU lift to 4,039 for the Alternative C360C at no additional cost (**Table 4-9**).

Greater Everglades

Benefits to the Greater Everglades would increase with increased water storage capacity. Unlike the Northern Estuaries, the proposed operational efficiencies would not accrue additional benefits to the Greater Everglades (**Table 4-9**). Difference in benefits to the Greater Everglades between alternatives occurs in the northeastern zone of WCA 3A (3A-NE) and in the southern ENP. As the available water flows south, the hydrology and associated ecological benefits equilibrate across the system.

Florida Bay

Habitat benefits to the East Central portion of Florida Bay would increase if water storage capacity was increased to 240,000 ac-ft in the EAA (**Table 4-5** and **Table 4-9**) but does not increase any further if the capacity is further increased. More water delivered through the Taylor Slough in Florida Bay East Central (FB-EC) between Alternative R240 (A or B) and Alternative R360 (C or D) increases habitat lift by 44% (1,800 HU lift for Alternative R240 compared with a 2,600 HU lift for Alternative R360; **Appendix G, Table G-18**). No change in HUs would be expected with consideration for operational efficiencies.

4.3 SUMMARY OF OUTPUTS FOR THE PRINCIPLES AND GUIDELINES EVALUATION CRITERIA

Based on the information included in the preceding descriptions of the Principles and Guidelines evaluation criteria, the following table (**Table 4-11**) rates each alternative on its ability to meet the specified criteria (Ø not applicable; ≠ does not meet; + partially meets; ++ fully meets). Alternative R240A rated slightly higher than Alternatives R240B, R360C, R360D, and C360C in meeting the evaluation criteria (**Table 4-11**). **Section 4.1.1** showed that all alternatives were similar in their effectiveness. **Section 4.1.2** showed there were similar levels of acceptability among the array of alternatives with the notable exception of some preference for the R240A and R240B alternatives based on concerns that the existing A-1 FEB should remain in place. Alternatives R360C, R360D, and C360C would require incorporating the A-1 FEB into the proposed storage reservoir. Resource agencies and interest groups had expressed concerns about potential impacts to the Restoration Strategies Project, the associated Consent Agreement, and the potential additional actions that might be necessary to offset those adverse effects if the A-1 FEB were converted to deep storage. **Section 4.1.3** showed that all alternatives have the same completeness since all alternatives depend on implementation of the same set of CERP, CEPP, and non-CERP projects. **Section 4.2.1** showed that Alternatives R240 and C360C were cost effective while the other three alternatives were not.

Table 4-11. Principles and Guidelines Evaluation Criteria

Evaluation Criteria	Alt R240A	Alt R240B	Alt R360C	Alt R360D	Alt C360C
Effectiveness (**Section 4.1.1**)	+	+	+	+	+
Acceptability (**Section 4.1.2**)	+	+	≠	≠	≠
Completeness (**Section 4.1.3**)	+	+	+	+	+
Efficiency (**Section 4.2.1**)	++	≠	≠	≠	+

4.4 RECOVER SYSTEM-WIDE EVALUATION

CERP's interagency science group, RECOVER, conducted a broad-scale evaluation of ecological effects during the planning phases of CEPP. The scope of their review covered all areas expected to be improved by CERP, beyond the boundaries expected to be improved by CEPP, and includes a broad range of evaluation tools, performance measures, and best professional judgment that reach beyond the tools and expertise of the traditional USACE planning process. The tools and professional backgrounds of the reviewers represented decades of experience studying and modeling the ecology of south Florida. The purpose of the review was three-fold: to provide insight into whether some alternatives performed better ecologically than others, to indicate whether alternatives may lead to unintended ecological conditions, and to investigate for unintended effects beyond CEPP's boundaries that could potentially contradict CERP on a regional scale.

Key elements of the RECOVER evaluation were incorporated into the CEPP PACR. Some evaluation tools developed during CEPP, as well as hydrologic performance measures, were applied in assessing the effects of various alternatives in the CEPP PACR. Given the limited scope of analysis of the CEPP PACR, the RECOVER team was not assembled. Instead, some members of RECOVER participated in an interagency PDT that supported alternative development and selection.

Key Elements of RECOVER incorporated into the CEPP PACR:

- All areas that CEPP intended to improve will benefit from the proposed alternatives presented in the CEPP PACR. These include the Northern Estuaries, the Greater Everglades, and the southern coastal systems.
- The CEPP PACR planning team's intent was to remain within the existing water schedule for Lake Okeechobee and thereby not impact the Lake's ecology. Modeling indicated that there are periods where the Lake's water level is held approximately 6 to 12 inches higher than ECB or FWO levels, while remaining within the current schedule. The higher water events are expected to be rare enough to avoid significant ecological effects.
- The CEPP PACR modeling of hydrology, salinity, and associated ecology of the St. Lucie and Caloosahatchee Estuaries, referred to collectively as the Northern Estuaries, showed a reduction in fresh water discharges from Lake Okeechobee to the Northern Estuaries. Consistent with CEPP, these changes are 'in the right direction' for reducing peak flow events to the Northern Estuaries. Modeling indicated less fresh water entering the St. Lucie Estuary during low-flow times, when small amounts of fresh water are needed. CEPP PACR operations and future

increments of CERP should remain aware of the need for small amounts of base flow into the estuaries during drier times. Future operations of the Indian River Lagoon-South project can be optimized to help provide these base flows.

- In the Greater Everglades, all CEPP alternatives provided significant improvement towards restoration. All of the CEPP PACR alternatives showed improved ecological performance compared with the FWO, which assumes that the authorized CEPP features are constructed and in operation. Consistent with CEPP, improved ecological performance would be expected for fish, wading birds, and apple snails. Improved hydroperiods and sheetflow in WCA 3A, WCA 3B, and ENP result in less soil oxidation, which promotes the peat accretion necessary to rebuild the complex mosaic of habitats across the landscape. Overall, all the alternatives appear to add similar volumes of water to the Everglades according to the surface flow vectors and sheetflow information performance measure outputs. Consistent with the CERP Programmatic Regulations Section 385.31, adaptive management consistent with CEPP will be employed to inform decisions and coordination regarding knowledge gained as structures are completed and operated. The role of adaptive management in informing implementation is discussed in **Section 6** and in **Annex D Part 1**.
- The adaptive management approach taken in CEPP was built upon to positively influence the implementation of the CEPP PACR in sensitive areas. Adaptive management provides a means to learn during implementation and operations, improves delivery of benefits, and can minimize impacts; therefore adaptive management is a significant source of ecological risk buy-down for the CEPP PACR.

4.5 SUMMARY OF OUTPUTS FOR THE FOUR ACCOUNTS

Upon identification of the array of alternatives, each alternative plan and the FWO were evaluated and compared to identify the expected effects on the environment, the economy, society, and how well each plan met project objectives and remained within constraints.

4.5.1 National Economic Development

NED benefits are defined as increases in the economic value of the goods and services that result directly from a project. These are benefits that occur as a direct result of the project and are national in perspective. Benefit categories considered by the analysis include recreation, water supply, and flood control. These three categories represent important national considerations; however, the primary formulation of CEPP is ecosystem restoration.

While selecting a plan is predicated on the degree and significance of environmental restoration efforts, the health of the environment has a correlation with economic and social well-being. The environmental restoration efforts of the CEPP PACR are expected to improve conditions in the Northern Estuaries, central Everglades and Florida Bay, which will lead to both direct and indirect economic benefits to commercial fisheries, property value, tax revenue, tourism and other significant economic sectors. It is recognized that further actions are needed to achieve the restoration envisioned in CERP that will have a direct correlation to the economic and social well-being of south Florida.

Water supply is a stated objective of CERP and CEPP; therefore, water supply improvements were considered during the formulation of alternatives. Through operational refinements and optimization of the TSP, further consideration to identify additional water availability for the EAA was undertaken.

Recreation benefit quantification is necessary because those benefits would be used to justify costs of construction of proposed recreation features. Flood control is a constraint of the project and the alternatives successfully maintained the level of service for flood protection. Negligible improvements to flood control for Lake Okeechobee and moderate improvements in WCA 3A, Zone A stage frequencies were identified. Minor beneficial improvements to Lake Okeechobee navigation will be realized with the implementation of any alternative as a result of increased stages in the low stage range to the lake (see **Appendix A, Annex A-2, Figure 4.2**).

4.5.2 Environmental Quality

The EQ account is used to present non-monetary effects on ecological, cultural, and aesthetic resources including the positive and adverse effects of ecosystem restoration plans. The EQ outputs for this project are displayed in **Section 5** and as HUs that were assessed for cost effectiveness and incremental cost analysis in **Section 4.2**.

4.5.3 Regional Economic Development

All alternatives are anticipated to provide RED benefits. In particular, the construction of any recommended features would have a beneficial effect on employment and demand for local goods and services during the construction period. In addition, if recreational features are included it is anticipated that some lasting benefits would accrue to the area as a result of additional recreational use and the associated economic activity. The recreational benefits are detailed in **Appendix F**.

The expenditures are related to construction activities and the employment that will occur when the expenditures are executed. The total jobs created by CEPP was based on State-wide impacts of construction expenditures and estimated using 15.3 jobs per $1 million spent and was developed using the impact analysis for planning input/output software. Impacts may vary depending on when construction funding is expended. The number of jobs created from the conversion of an FEB to an above-ground storage reservoir and construction of an STA would be similar to the number of jobs created by CEPP. No change from the FWO would be expected by the array of alternatives considered in the CEPP PACR.

4.5.4 Other Social Effects

Potential areas of social effects have been assessed as part of the study process. The key areas analyzed to date are summarized below. Relatively similar impacts would be anticipated for all alternatives.

Prime and Unique Farmland: The majority of land within the CEPP project area is ridge and slough, sawgrass marsh, coastal wetlands and nearshore/open bay habitat with minimal potential for reduction in unique farmland. All project lands are State owned. Coordination is ongoing with the United States Department of Agriculture (USDA) and National Resources Conservation Service (NRCS) to meet the requirements of the Farmland Protection Policy Act. The EAA area proposed for conversion from prime and unique farmland in the CEPP PACR includes 500 acres in the A-2 Expansion area in addition to the A-2 parcel included in CEPP. The A-2 Expansion area represents less than 1% of farmland in the EAA.

Environmental Justice: E.O. 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, requires Federal agencies to identify and address significant and adverse environmental effects of proposed Federal actions on minority and low-income communities. It requires the analysis of information such as the race, national origin and income level for areas expected to be impacted by environmental laws, regulations and policies. It also requires Federal agencies to identify the need to ensure the protection of populations relying on subsistence consumption of fish and wildlife, through analysis of information on such consumption patterns and the communication of associated risks to the public. The CEPP PACR alternatives would all provide benefits to quality of life by further improving conditions in the Northern Estuaries and contributing to hydrological and water quality improvements in the historic Everglades beyond those expected in the FWO project condition. The project would improve the quality of human life by providing improved estuarine conditions for fish and wildlife. It would translate into aesthetic and economic benefits for sport fishing and other recreational communities. No homeowners would be displaced by the project.

The CEPP PACR alternatives would not result in any environmental impacts that would be disproportionately high and adverse to low income, minority, or Tribal communities. The activity does not (a) exclude persons from participation in, (b) deny persons the benefits of, or (c) subject persons to discrimination because of their race, color, or national origin. Through the scoping and public participation processes undertaken for the development of the CEPP PACR, concerns were raised that lands converted from agriculture would impact jobs in the EAA. As described throughout the CEPP PACR, the lands considered for alternatives are those currently owned by the State in the A-1 and A-2 parcels and additional lands to the west of A-2 (A-2 Expansion area) offered by willing sellers. The A-1 parcel is currently being operated as an FEB and the A-2 parcel was authorized for construction of an FEB under CEPP. The A-2 Expansion area covers 4,155 acres of the EAA representing less than 1% of the agricultural land in the EAA. Therefore, based on the public comments received, no adverse impacts were identified. There was sufficient public input to feel confident that scoping was successful and that the breadth of the potential impacts were communicated and understood by the public. Environmental Impacts to Tribal populations are discussed in **Section 5.3** and public involvement is described in **Section 7.1**.

Protection of Children: E.O. 13045, *Protection of Children from Environmental Health Risks and Safety Risks*, requires each Federal agency to “identify and assess environmental risks and safety risks [that] may disproportionately affect children and ensure that its “policies, programs, activities, and standards address disproportionate risks to children that results from environmental health risks or safety risks.” The proposed project will not result in environmental health risks or safety risks that may have a disproportionate effect on children.

Safety/Health: All alternatives would be designed to meet dam safety requirements. All alternatives would maintain the WCA 3A Zone A regulation schedule, the LORS management bands, and the level of service for flood protection in the LEC.

Community Cohesion: Community cohesion would not change. No additional land purchase other than the 500 acres is proposed. No real estate relocations of residences are proposed.

Recreation: All recreation features included in the CEPP plan would remain the same except those associated with the storage, treatment, and conveyance measures in the EAA included in the CEPP PACR alternatives. All the CEPP PACR alternatives would change the authorized CEPP A-2 FEB to an above-ground storage reservoir and STA, and the 360,000 ac-ft storage alternatives would convert the A-1 FEB to a combination of an above-ground storage reservoir and STA. Compared to CEPP, similar areas of land would be affected but the recreational experiences they would offer would be different because of the site conditions (e.g., storage reservoir and STA versus FEB). Nonetheless, public access to all areas would be maintained for recreational use.

4.6 IDENTIFICATION OF THE TENTATIVELY SELECTED PLAN (OR TENTATIVE NATIONAL ECOSYSTEM RESTORATION PLAN)

The overarching goal of the CEPP PACR is the environmental restoration of an Everglades ecosystem considered to be of both national and international significance. An alternative plan that reasonably maximizes ecosystem restoration benefits compared to costs, consistent with the Federal objective, is identified as the NER. Selecting the TSP (or tentative NER plan) requires careful consideration of the plan that meets planning objectives and constraints and reasonably maximizes environmental benefits while passing tests of cost effectiveness and incremental cost analyses, significance of outputs, acceptability, completeness, efficiency, and effectiveness. In accordance with USACE guidance, the selected plan must be shown to be cost effective and justified to achieve the desired level of output (ER-1105-2-100 Appendix E, paragraph E-41).

The CEPP plan was the first incremental step in increasing average annual flows to the central Everglades. This first increment of CEPP provided approximately 210,000 ac-ft on an average annual basis to the central Everglades, which is approximately two-thirds of the CERP performance goal.

Screening efforts in plan formulation for the CEPP PACR utilized the CERP Goal and attempted to deliver the remaining one-third of new water essential to Everglades restoration consistent with the CERP performance goal.

Early screening outcomes identified a high potential for this project to meet or exceed the CERP Goals in sending water to the central Everglades. The screening analysis compared the Pre-CERP Baseline (USACE 2005) with the CERPA scenario, the updated model scenario from the RECOVER 2005 Initial CERP Update effort (RECOVER 2005), to establish the CERP Goal for flow to the central portion of the Everglades. This analysis identified the CERP Goal flow target of approximately 300,000 ac-ft of new water on an average annual basis over the 36-year modeled simulation period (1965-2000) available from RECOVER.

This CERP Goal flow target, based on a 36-year period of record, became the updated target for continued plan formulation work. The most cost-effective alternative (R240A) was refined and modeled further to optimize its performance based on the operational protocols included in the C360C alternative to become C240A, or the TSP. Alternative C240A was ultimately able to achieve 97% of the CERP Goal over this 36-year period of record (see **Figure 4-10**). However, consistent with CEPP, Alternative C240A was modeled and analyzed over the longer 41-year period of record (1965-2005). Similar to CEPP, the 41-year period of record was used in the evaluation of effects for the CEPP PACR. This evaluation of Alternative C240A provides an approximately 370,000 ac-ft increase in average annual flow to the central Everglades meeting the CERP Goal. Also consistent with CEPP, the 41-year period of record was used for the water quality evaluation to ensure adequate treatment of the increase flow.

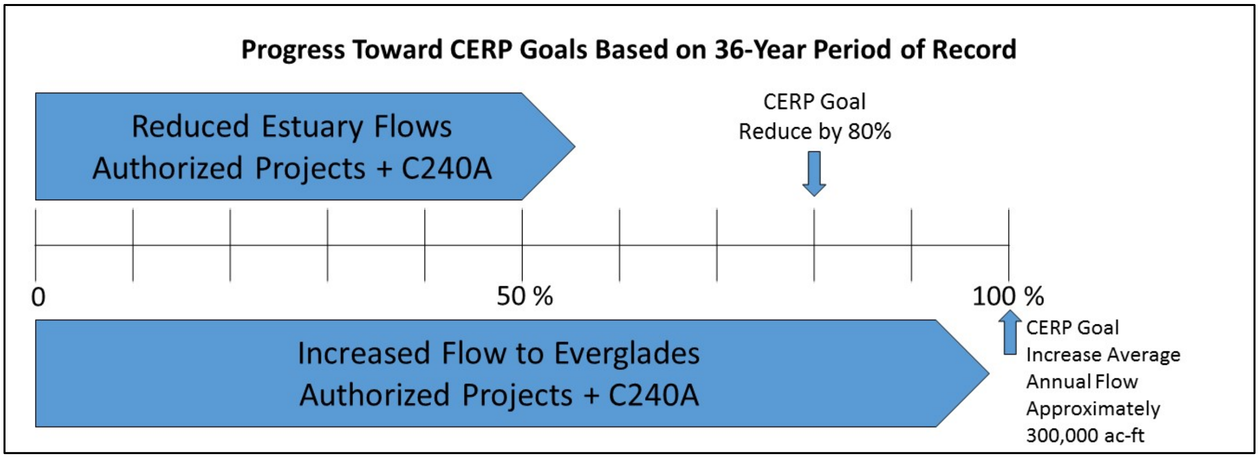

Figure 4-10. Progress toward Meeting CERP Restoration Goals with Alternative C240A

4.6.1 Operational Refinements of the Array and Identification of the TSP (Tentative NER Plan)

Alternative designs to decrease the construction costs and add multi-purpose operations to a 240,000 ac-ft storage reservoir were recommended based on the acceptability analysis (**Section 4.1.2**) and efficiency analysis (**Section 4.2.3.2**). The incremental annual average cost versus annual average HUs illustrated that Alternative R240A ($2,564) is incrementally more cost effective than the Alternative C360C ($3,029) (**Table 4-10**). Learning from the operational benefits gained from Alternative C360C, similar operations were applied to the 240A design configuration (**Figure 4-10**). Operations were refined for Alternative R240A, creating Alternative C240A, to provide additional ecological benefits to the Northern Estuaries, the Greater Everglades, and for other water-related needs of the region. These refined operations are described in detail in **Annex C**. Alternative C240A performed better than the more costly best buy, Alternative C360C (**Appendix G** and **Table 4-12**). The performance improvements were observed with modeling refinements and increased habitat unit assessment results identified by the operational flexibility (environmental benefits and other water related needs) provided by the C240A alternative. Alternative C240A would be expected to offer a total 28,768 HU lift over the FWO. The C240A alternative preserves the A-1 FEB of the State's Restoration Strategies Program project features. The average annual cost per average annual HUs of Alternative C240A is $1,961 because Alternative C240A has the same cost as Alternative R240A but offers more ecological benefits in terms of HUs.

Table 4-12. Alternative Benefits as Habitat Units

Project Region (Zone)	ECB[1]	FWO[2]	Alt R240A Alt R240B[2]	Alt C240A	Alt R360C Alt R360D[2]	Alt C360C[2]
Caloosahatchee Estuary (CE-1)	2,839	39,038	40,458	41,168	41,168	41,878
St Lucie Estuary (SE-1)	1,349	8,247	8,996	9,296	9,446	9,446
Total Northern Estuaries	**4,188**	**47,285**	**49,454**	**50,464**	**50,614**	**51,324**
Northeast WCA 3A (3A-NE)	44,451	91,372	92,606	95,076	92,606	92,606
WCA 3A Miami Canal (3A-MC)	32,847	54,746	56,310	59,438	56,310	56,310
Northwest WCA 3A (3A-NW)	30,970	54,198	55,606	57,013	55,606	55,606
Central WCA 3A (3A-C)	108,414	111,159	111,159	111,159	111,159	111,159
Southern WCA 3A (3A-S)	69,247	68,423	69,247	69,247	69,247	69,247
WCA 3B (3B)	55,697	59,125	59,982	59,982	59,982	59,982
Northern ENP (ENP-N)	57,557	97,596	100,098	98,847	100,098	100,098
Southern ENP (ENP-S)	124,068	169,400	171,786	171,786	174,172	174,172
Southeast ENP (ENP-SE)	79,711	83,764	83,764	83,764	83,764	83,764
Total Greater Everglades (WCA 3 & ENP)	**602,962**	**789,783**	**800,558**	**806,312**	**802,944**	**802,944**
Florida Bay West (FB-W)	23,700	41,100	44,200	44,200	44,200	44,200
Florida Bay Central (FB-C)	8,200	13,950	15,600	15,600	15,600	15,600
Florida Bay South (FB-S)	16,600	28,300	30,300	30,300	30,300	30,300
Florida Bay East Central (FB-EC)	22,000	34,300	36,100	36,100	36,900	36,900
Florida Bay North Bay (FB-NB)	2,150	2,660	2,790	2,790	2,790	2,790
Florida Bay East (FB-E)	9,060	9,820	10,200	10,200	10,200	10,200
Total Florida Bay	**81,710**	**130,130**	**139,190**	**139,190**	**139,990**	**139,990**
Total All Regions	**688,860**	**967,198**	**989,202**	**995,966**	**993,548**	**994,258**

[1] HU values for the ECB are consistent with CEPP.
[2] HU values for the FWO and alternatives are calculated for the full ecological response time.

4.6.2 Identifying the Tentatively Selected Plan

Alternative C240A (**Figure 4-11**) is identified as the TSP because it offers the lowest cost reservoir and operational design but provides similar benefits, in terms of HUs, as the larger 360,000 ac-ft storage reservoir when water supply is a component of operations (Alternative C360C). The Alternative C240A allows the same level of benefits, for less cost and meets the expressed desires of stakeholders by:

- Decreasing the occurrence of undesirable regulatory releases from Lake Okeechobee moving closer to the CERP Goal
- Increasing flows to the central Everglades to an average annual 370,000 ac-ft achieving the CERP Goal

The C240A alternative project features consist of:

- 240,000 ac-ft storage reservoir, plus A-1 FEB
- 10,500-acre reservoir, approximately 23 ft deep
- 6,500 acre STA
- Conveyance improvements to the Miami and NNR Canal (1,200 cfs)
- Multi-purpose project operations

- New conflict structure to route treated STA water under the STA 3/4 intake canal and discharge to the Miami Canal south of G-373 divide structure.

The C240A plan and the overall justification for its selection as the TSP is presented in more detail in **Section 6**.

Figure 4-11. CEPP PACR Tentatively Selected Plan

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5.0 EFFECT OF THE ARRAY OF ALTERNATIVES AND THE TENTATIVELY SELECTED PLAN

5.1 EFFECTS OF THE ARRAY OF ALTERNATIVES

This assessment of effects evaluates the anticipated environmental effects of the array of alternatives considered in this CEPP PACR, as described in **Section 3.0** and **Section 4.0**. Since the array of alternatives contained a no action alternative (for consistency of the report the **No Action Alternative** is referred to as the **Future Without [FWO]** for the remainder of the report), the other five alternatives (R240A, R240B, R360C, R360D, and C360C) were compared to the FWO condition to assess and describe the potential effects associated with implementation of each CEPP PACR alternative. These alternatives represent different STA and reservoir configurations as presented by the A, B, C, and D; different reservoir storage volumes where 240 is 240,000 ac-ft and 360 is 360,000 ac-ft; and different operating schemes where R represents reservoir storage operations only and C is consistent with CERP's goal of multiple purpose operations (i.e., environmental restoration and other water related needs). The hydrologic modeling performed to evaluate the effects of the alternatives was not modified for the different configurations (A vs. B, and C vs. D); therefore, hydrologic modeling results are presented for R240, R360, and C360. The modeling results for R240 represent conditions for either Alternative R240A or Alternative R240B. Similarly, the modeling results for R360 represent conditions for Alternatives R360C or R360D, and finally the modeling results for C360 represent conditions for Alternative C360C. The potential effects of the alternatives are summarized within this section and full details are discussed in **Appendix C.2.1**.

The following intensity and duration terminology was utilized for the CEPP PACR to be consistent with the 2014 CEPP PIR.

<u>Intensity</u> was rated as follows for this analysis:

- Negligible—effect to the resource or discipline is barely perceptible and not measurable and confined to a small area
- Minor—effect to the resource or discipline is perceptible and measurable and is localized
- Moderate—effect is clearly detectable and could have appreciable effect on the resource or discipline; or the effect is perceptible and measurable throughout the project area
- Major—effect would have a substantial, highly noticeable influence on the resource or discipline on a regional scale

<u>Duration</u> was defined as follows:

- Short term—when effects last less than one year
- Long term—effects that last longer than one year
- No duration—no effect

5.1.1 Climate

The subtropical climate of south Florida, with its distinct wet and dry seasons, high rate of evapotranspiration, and climatic extremes of floods, droughts, and hurricanes, represents a major physical driving force that sustains the Everglades while creating water supply and flood control issues in the agricultural and urban segments. Implementation of any of the CEPP PACR alternatives would have a negligible effect compared with the FWO. Localized effects to microclimate may occur consistent with the FWO as a result of redistribution of water and shifts in vegetation.

5.1.2 Geology and Soils

Any of the CEPP PACR alternatives would result in conversion of the CEPP A-2 FEB to an above-ground storage reservoir(s) and STAs. Reduction in sediment and silt would have minor beneficial effects on the Northern Estuaries. In the southern portion of the EAA, conversion of agricultural lands to storage and treatment wetlands would have a moderate beneficial effect to soils within the project footprint by reducing dry condition-based soil subsidence. Moderately improved hydroperiods and sheetflow in the northern regions of WCA 3A would be expected to reduce soil oxidation, which would, in turn, promote peat accretion necessary to rebuild the complex mosaic of habitats across the landscape. Minor hydroperiod improvements to the rest of the Greater Everglades would have a negligible effect on soil oxidation. All alternatives show a minor increase in inundation duration over the FWO that would decrease soil oxidation, subsidence, and peat fires and increase carbon sequestration. All alternatives showed a minor improvement in hydrologic conditions in northern WCA 3A, especially in the northwest. Consistent with other regions of the Greater Everglades, alternatives scored equal to or slightly higher than the FWO in meeting the desired targets for measures of inundation duration, drought intensity, and slough vegetation suitability.

5.1.3 Vegetation

All the CEPP PACR alternatives reduce the frequency and duration of low and extremely low lake stages in Lake Okeechobee, and slightly increase the frequency and duration of extremely high lake stages. Additionally, lake stages in the middle to lower portions of the beneficial envelope (12.5 to 15.5 feet [ft] NGVD) would occur less frequently under all alternatives. Overall, however, lake stages would be within the beneficial range more often under all alternatives, relative to the FWO. Additionally, all alternatives show performance improvement within the Northern Estuaries as indicated by fewer high-volume flow months and less frequent damaging events, providing a moderate beneficial effect. Reduction in return frequencies, high flows, and accompanying flow velocities would result in lower suspended solids, color, and colored dissolved organic matter, thereby allowing greater light penetration to promote growth of SAV.

Conversion of sugar cane agricultural fields to freshwater wetlands on the A-2 Expansion area would provide additional benefit of carbon sequestration. Refer to **Appendix C.2.1** for a detailed comparison of potential effects to vegetation.

Mangrove communities and seagrass beds associated with the Northern Estuaries would likely show a moderate, long-term benefit under all alternatives due to decreased high-level freshwater inputs resulting in reduced salinity fluctuations and improved water clarity.

Due to changes in the quantity, quality, distribution, and timing of water entering the Greater Everglades ecosystem, only minor, long-term improvements on wetland hydrology and vegetation would potentially occur under each alternative. The primary factors influencing the distribution of dominant freshwater wetland plant species of the Everglades are soil type, soil depth, and hydrological regime (USFWS 1999). All CEPP PACR alternatives had negligible improved hydroperiods and sheetflow in WCA 3A and ENP that may result in a localized, but long-term reduction in soil oxidation, thereby promoting peat accretion necessary to rebuild the complex mosaic of habitats across the landscape. All CEPP PACR alternatives provided no improvements in hydroperiods in WCA 2A or 2B compared to the FWO.

Implementation of any of the CEPP PACR alternatives is expected to moderately rehydrate much of northern WCA 3A by redistributing treated STA discharges from the L-4 Canal north of WCA 3A in a manner that promotes sheetflow. Any resumption of sheetflow and related patterns of hydroperiod extension and increased water depths would help to restore and sustain the microtopography, directionality, and spatial extent of ridges and sloughs and improve the health of tree islands in the ridge and slough landscape. Although none of the alternatives would provide the necessary inundation pattern for complete slough vegetation restoration, all alternatives act to rehydrate the northern WCA 3A, promoting peat accretion, reducing the potential for high intensity fires, and promoting transition from upland to wetland vegetation.

None of the alternatives met the desired dry and wet season water depths for slough vegetation in WCA 3B; however, none was hydrologically different from each other or from the FWO.

Implementation of any of the CEPP PACR alternatives would be expected to moderately rehydrate much of the ENP by increasing flows from WCA 3A to the Northeast Shark River Slough (NESRS), a beneficial effect. Any resumption of sheetflow and related patterns of hydroperiod extension would help to restore pre-drainage patterns of water depths and the complex mosaic of Everglades' vegetation communities. As compared with FWO in the ENP, all alternatives produced negligible greater depths and inundation durations.

Mangrove communities and seagrass beds associated with Florida Bay would be expected to show a negligible, long-term, and less than significant benefit under all alternatives from a very small reduction in average salinities.

Non-native and invasive plant infestations may temporarily occur during construction from soil disturbance. Project alternatives may increase nutrient load when compared to the FWO which may also increase the non-native invasive plants and will be addressed by the Adaptive Management Plan. Additional information can be found in **Annex D**. The degree of disturbance associated with the CEPP PACR alternatives is expected to be negligible in comparison to the FWO.

5.1.4 Threatened and Endangered Species

The CEPP PACR affected area potentially contains habitat suitable for the presence, nesting, and/or foraging of 32 Federally-listed threatened, endangered, and candidate flora and vertebrate and invertebrate fauna. Federally threatened, endangered, and candidate species that may occur within the study area include:

Vertebrate fauna – Florida panther (*Puma concolor coryi*), Florida population of West Indian Manatee (Florida manatee) (*Trichechus manatus*) and its critical habitat, Cape Sable seaside sparrow (*Ammodramus maritimus mirabilis*) (CSSS) and its critical habitat, Everglade snail kite (*Rostrhamus sociablis plumbeus*) and its critical habitat, Northern crested caracara (*Caracara cheriway*), piping plover (*Charadrius melodus*), red-cockaded woodpecker (*Picoides borealis*), roseate tern (*Sterna dougallii dougallii*), wood stork (*Mycteria america-na*), American alligator (*Alligator mississippiensis*), Florida bonneted bat (*Eumops floridanus*), American crocodile (*Crocodylus acutus*) and its critical habitat, Eastern indigo snake (*Drymarchon corais couperi*), smalltooth sawfish (*Pristis pectinata*) and its critical habitat, green sea turtle (*Chelonia mydas*), hawksbill sea turtle (*Eretmochelys imbricata*), leatherback sea turtle (*Dermochelys coriacea*), Kemp's ridley sea turtle (*Lepidochelys kempii*), and loggerhead sea turtle (*Caretta caretta*).

<u>Invertebrate fauna</u> – Schaus swallowtail butterfly (*Heraclides aristodemus ponceanus*), Miami blue butterfly (*Cyclargus thomasi bethunebakeri*), Florida leafwing butterfly (*Anaea troglodyta floridalis*), Bartram's hairstreak butterfly (*Strymon acis bartrami),* and Stock Island tree snail (*Orthalicus reses* [not incl. *nesodryas*]).

<u>Flora</u> – Crenulate lead-plant (*Amorpha crenulata*), Cape Sable thorough-wort (*Chromolaena frustrata*) deltoid spurge (*Chamaesyce deltoidea* ssp. *deltoidea*), Garber's spurge (*Chamaesyce garberii*), Okeechobee gourd (*Cucurbita okeechobeensis* ssp. *okeechobeenis*), Small's milkpea (*Galactia smallii*), tiny polygala (*Polygala smallii*), and Johnson's seagrass (*Halophila johnsonii*) and its critical habitat.

Table 5.1-1 compares the FWO and all action alternatives with their potential effects on Federally listed threatened and endangered species. Further details on the life history of each species and their effects determinations can be found in the Biological Assessment in **Annex A.** For a more detailed analysis, please refer to **Appendix C.2.1**.

Table 5.1-1. Effects Comparison of FWO and CEPP PACR Alternatives on Federally-Listed Threatened and Endangered Species

Threatened and Endangered Species (Please refer to Biological Assessment [Annex A] for further details on life history of each species.)		
Species	**FWO**	**With Project Conditions**
Everglade Snail Kite and its critical habitat	Rehydration and desirable vegetation shifts within northern WCA 3A, WCA 3B and increased hydroperiods within ENP would increase suitable habitat for apple snails, thereby increasing spatial extent of suitable foraging opportunities for snail kites providing a moderate and significant beneficial effect. Southern WCA 3A would continue to experience extended hydroperiods due to ponding along the L-67a and L-29. High water levels and extended hydroperiods have resulted in vegetation shifts within WCA 3A, degrading Everglade snail kite critical habitat.	Reduced frequency and duration of extreme low lake stages on Lake Okeechobee, slightly longer hydroperiods and desirable vegetation shifts within northwestern WCA 3A, and conversion of A-2 Expansion area to treatment wetlands could increase suitable habitat for apple snails, thereby increasing spatial extent of suitable foraging opportunities for snail kites, providing a minor beneficial effect. All alternatives may have a minor beneficial effect on Everglade snail kite critical habitat.
Cape Sable Seaside Sparrow (CSSS) (Hydroperiod and Nesting condition) and its critical habitat	The FWO has the potential to provide a major adverse effect and significant and unavoidable effect on hydroperiods within the marl prairies adjacent to NESRS. Longer hydroperiods than the existing condition are predicted within CSSS-E and southern portions of CSSS-A. Mitigation and monitoring will be performed to minimize the impacts.	The incremental effects of the minor increase in hydroperiod durations are anticipated to cause a minor to moderate negative effect on the CSSS nesting pattern as compared to the FWO. However, the mitigation efforts from the major adverse effects created by the FWO would be expected to continue (see **Annex D**).

Table 5.1-1. Effects Comparison of FWO and CEPP PACR Alternatives on Federally-Listed Threatened and Endangered Species (continued)

Threatened and Endangered Species (Please refer to Biological Assessment (Annex A) for further details on life history of each species.)		
Species	**FWO**	**With Project Conditions**
Wood Stork	Beneficial and significant effects for habitat and foraging conditions for wood storks throughout much of the Greater Everglades.	All the alternatives provided relatively similar increases in hydroperiods. Any increase in hydroperiods provides longer duration foraging, as long as depths do not exceed 1 foot (ft). This is particularly important for wood storks because of their long nesting season and the need to fledge nestlings before the summer rains arrive.
Eastern Indigo Snake	Habitat loss from implementation of the FWO project components includes the footprint of the A-2 FEB and backfilling of the Miami Canal in WCA 3A.	Since Eastern indigo snakes occur primarily in upland areas, their presence within the Greater Everglades portion of the project area is somewhat limited; however, they have a high probability of occurrence within the project construction footprint. Standard protection measures for the Eastern Indigo snake will be implemented during construction in order to minimize impacts.
American Alligator (similarity of appearance to the American Crocodile)	Rehydration within northern WCA 3A, WCA 3B and increased hydroperiods within ENP increase spatial extent and quality of suitable habitat for the American alligator.	All action alternatives provide minor beneficial effects on habitat suitability for American alligator within the northern WCA 3A. Hydroperiod improvements within ENP would be expected to have a negligible or minor positive impact in the long term on the spatial extent and quality of suitable habitat for the American alligator.
American Crocodile and its critical habitat	Reduction in salinity fluctuations provides minor beneficial effects and improve habitat suitability for American crocodile	All alternatives would slightly increase freshwater flows, ultimately reducing salinity fluctuations, which would be expected to provide minor beneficial effects and improve habitat suitability for the American crocodile.
Manatee and its critical habitat	Reduction in high-volume discharge events from Lake Okeechobee to the Northern Estuaries would reduce stress on seagrass beds, thereby increasing foraging potential for manatees within this region and provide minor beneficial effects to the manatee and its critical habitat. Increased flows to Florida Bay would improve salinity, thereby reducing stress on seagrasses important to foraging manatees and provide minor beneficial effects to the manatee and its critical habitat. All alternatives may effect, but are not likely to adversely effect, designated critical habitat for the Florida manatee.	Conditions would be similar to the FWO. High-volume discharge events from Lake Okeechobee to the Northern Estuaries would decrease and the duration of these events would decrease further reducing stress on seagrass beds, thereby increasing foraging potential for manatees within this region and provide minor beneficial effects to the manatee and its critical habitat.

Table 5.1-1. Effects Comparison of FWO and CEPP PACR Alternatives on Federally-Listed Threatened and Endangered Species (continued)

Threatened and Endangered Species (Please refer to Biological Assessment (Annex A) for further details on life history of each species.)		
Species	**FWO**	**With Project Conditions**
Panther	Loss of 14, 000 acres of upland habitat due to FEB and potential loss of upland habitat due to backfilling the Miami Canal in WCA 3A provides a minor adverse effect.	For all alternatives, conversion of upland habitat that could be potentially used by the Florida panther to traverse the area to wetland habitat, thereby eliminating potential habitat for the Florida panther, would result in an adverse effect to this species.
Smalltooth Sawfish and its critical habitat	The FWO conditions provides a minor beneficial effect to the smalltooth sawfish and its critical habitat by reducing the volume of high-level flows from Lake Okeechobee to the northern estuaries. Reduction in flows to the northern estuaries will improve the overall salinity regime and habitat quality. Improving freshwater delivery to downstream estuaries in ENP and Florida Bay will reduce salinity fluctuations and increase habitat suitability for the smalltooth sawfish.	All of the alternatives have the potential to provide a minor beneficial effect to the smalltooth sawfish and its critical habitat by further reducing the volume of high-level flows from Lake Okeechobee to the Northern Estuaries. Reduction in flows to the Northern Estuaries would improve the overall salinity regime and habitat quality. Improving freshwater delivery to downstream estuaries in ENP and Florida Bay may further reduce salinity fluctuations and increase habitat suitability for the smalltooth sawfish.
Green Sea Turtle, Hawksbill Sea Turtle, Leatherback Sea Turtle, Kemp's Ridley Sea Turtle, Loggerhead Sea Turtle	Reduction in high volume discharge events from Lake Okeechobee to the Northern Estuaries would reduce stress on seagrass beds, thereby increasing foraging potential and nursery habitat for sea turtles thereby providing minor beneficial effects to sea turtles.	Further reduction in high-volume discharge events from Lake Okeechobee to the Northern Estuaries would reduce stress on seagrass beds, thereby increasing foraging potential and nursery habitat for sea turtles thereby providing minor beneficial effects to sea turtles. Increased flows to Florida Bay would improve salinity and reduce stress on seagrasses important to foraging sea turtles and would provide minor beneficial effects to sea turtles.

5.1.5 State Listed Species

The CEPP PACR project area contains habitat suitable for the presence, nesting, and/or foraging of 24 State-listed threatened, endangered, and species of special concern fauna and flora. State-listed species include:

Vertabrate fauna – Big Cypress fox squirrel (*Sciurus niger avicennia*), Everglades mink (*Mustela vison evergladensis*), Florida sandhill crane (*Grus canadensis pratensis*), snowy plover (*Charadrius alexandrius*), Southeastern American kestrel (*Falco sparveriuspaulus*), least tern (*Sterna antillarum*), white-crowned pigeon (*Columba leucocephalus*), burrowing owl (*Athene cunicularia*), little blue heron (*Egretta caerulea*), tricolored heron (*Egretta tricolor*), reddish egret (*Egretta rufescens*), American oystercatcher (*Haematopus palliates*), black skimmer (*Rynchops niger*), roseate spoonbill (*Platalea ajaja*), gopher tortoise (*Gopherus polyphemus*), and rim rock crowned snake (*Tantilla oolitica*). Species of special concern include the Sherman's fox squirrel (*Sciurus niger shermani*) and osprey (*Pandion haliaetus*) [the osprey is a State-listed species only for the Monroe county population].

Flora - pine-pink orchid (*Bletia purpurea*), which frequents the edges of the farm roads just above wetland elevation; the lattice-vein fern (*Thelypteris reticulate*) which is found occasionally in the forested wetlands; Eaton's spikemoss (*Selaginella eatonii*) and Wright's flowering fern (*Anemia wrightii*), both found in the Frog Pond natural area; along with the Mexican vanilla plant (*Vanilla mexicana*) and Schizaea tropical fern (*Schizaea pennula*) located on tree islands in the upper Southern Glades region.

While small areas of habitat utilized by many of these animal species may be affected by this project, the alternatives are not likely to have a significant adverse effect on listed State species. Adverse effects are anticipated to be short-term on protected State species. Impacts to wading bird species as a group would be similar to those specified in **Section 5.1.4** affecting the wood stork. Subtle changes in water quality can also support the prey base so that net beneficial effects on forage availability can be variable. Overall, negligible adverse impacts are anticipated to State-listed species as a result of this project. For a more detailed analysis, please refer to **Appendix C.2.1**.

5.1.6 Wildlife

A comparison of FWO and CEPP PACR alternatives and their potential effects on wildlife within the CEPP PACR affected area are summarized below. Effects on State and Federally listed species are described in further detail in **Sections 5.1.3** and **5.1.4** and **Appendix C.2.1.4**. For a more detailed analysis of Wildlife, see **Appendix C.2.1.5**. Further details on the effects of the alternatives can be found in the Biological Assessment in **Annex A**.

5.1.6.1 Invertebrates

Short-term, negligible effects to the invertebrate community within Lake Okeechobee are anticipated under all CEPP PACR alternatives. As compared with the FWO, all CEPP PACR alternatives show a minor beneficial effect with performance improvement within the Northern Estuaries as indicated by less frequent and fewer high-volume flow months. Reductions in high-volume discharges and salinity fluctuations would likely benefit oysters, benthic, and epibenthic invertebrates associated with seagrass, hardbottom, and mangrove communities within the Northern Estuaries. In both the Caloosahatchee and St. Lucie Estuaries, a minor adverse effect is expected due to the slight increases in low-flow violations during the dry season. Oyster monitoring data during extended dry conditions in the estuaries has shown an increase in oyster disease related to the timing, duration, and severity of high-salinity conditions. Supplemental flows during dry times may be warranted and have been accounted for in the IRLS water reservation process as well as the C-43 Reservoir water reservation. These dry season base flows should, whenever possible, be directed through the North Fork of the St. Lucie Estuary as was the case in pre-drainage conditions.

Within the EAA, it is anticipated that conversion of agriculture lands to an STA would improve habitat for invertebrates.

Within the Greater Everglades, aquatic invertebrates would be sustained by even slightly longer hydroperiods with implementation of any of the CEPP PACR alternatives, providing a long-term, moderate beneficial effect, especially in northern WCA 3A. Even slight increases in stages and hydroperiods within WCA 3A and ENP would promote wetland vegetation transition, increasing periphyton. Periphyton is a primary component of invertebrate diets, including apple snails. In addition to the potential for increased foraging opportunities, changes in vegetation resulting in expansion of wet prairie and increases in emergent vegetation would also provide habitat structure critical for apple snail aerial respiration and egg deposition (Turner 1996, Darby et al. 1999).

Crayfish are important components within the Everglades food web, serving as primary dietary components of higher trophic level species, including fish, amphibians, alligators, wading birds, and mammals such as raccoons and river otters (Kushlan and Kushlan 1979). Even the slight increases in hydroperiods associated with the CEPP PACR alternatives would likely increase crayfish density within northern WCA 3A and ENP, particularly within the marl prairies. CEPP PACR alternatives would increase hydroperiods within this region resulting in increased native crayfish productivity having a long-term, minor beneficial effect.

Invertebrate populations associated with nearshore Florida Bay may likely show a long-term, minor beneficial effect under all CEPP PACR action alternatives from a small increase in freshwater input resulting in minor decreased salinities.

5.1.6.2 Fish

Implementation of any of the CEPP PACR alternatives is expected to have a negligible effect in Lake Okeechobee and a minor beneficial effect on fish in the Northern Estuaries; by reducing the number of high-flow discharge events, improvements in fisheries habitat such as seagrass, and oyster beds are expected to occur. A negligible effect on fish species throughout much of Florida Bay, ENP, and the Greater Everglades would be expected, except for the northern WCA 3A, where moderate, long-term benefits are expected.

Within the EAA, it is anticipated that conversion of agriculture lands to freshwater wetlands within the STA would improve fish habitat.

Introduction or expansion of non-native fish species due to changes in water distribution is likely to occur; however, the extent of invasion is uncertain at this time, providing a minor adverse effect. Additional analysis of invasive and exotic fish can be found in **Section 5.1.17**.

5.1.6.3 Amphibians and Reptiles

While the project will be beneficial for aquatic and semi-aquatic species of herpetofauna such as the threatened American crocodile, some species such as the threatened Eastern indigo snake may lose habitat. The increased in hydroperiod may allow for the expansion of non-native herpetofauna such as large non-native snakes. Overall, long-term, minor beneficial effects to the amphibian and reptile communities are anticipated under the CEPP PACR alternatives. Within the EAA, it is anticipated that conversion of agriculture lands to freshwater wetlands within the STA would improve habitat for amphibians and reptiles. Rehydration within previously dry areas within the northern WCA 3A would increase spatial extent of suitable habitat for aquatic amphibian species in this area. Similarly, increased hydroperiods within ENP would also benefit aquatic amphibian species. As hydrology improves within WCA 3A and ENP, it is expected that amphibian species richness will also change. Increase in forage prey availability (i.e., crayfish and other invertebrates, fish) in areas rehydrated by CEPP PACR implementation would also directly benefit amphibian and reptile species.

5.1.6.4 Birds

The freshwater and estuarine wetlands of the Everglades and South Florida Estuaries are noted for their abundance and diversity of colonial wading and shore birds. Nesting and foraging activities of resident bird species are anticipated to show a long-term, moderate beneficial effect with implementation of any CEPP PACR alternative. Within the EAA, it is anticipated that conversion of agriculture lands to freshwater wetlands within the STA would improve habitat for bird species. Impacts to the Cape Sable seaside sparrow, snail kite, and wood stork are further discussed in **Appendix C.2.1**, **Section C.2.1.5**, and **Annex A**.

5.1.6.5 Mammals

As compared with the FWO, potential long-term, minor beneficial effects to mammals within the CEPP PACR affected area are anticipated with implementation of any alternative. As compared with FWO, the CEPP PACR alternatives would provide potential long-term, minor beneficial effects to mammals anticipated with implementation of any alternative. Small mammals including raccoons and river otters would benefit from increased numbers of crayfish and small prey fish biomass. The increase in water availability and rehydration within the northern WCA 3A and ENP under the CEPP PACR alternatives would likely benefit Everglades mink (*Mustela vison evergladensis*) as a result of increased foraging opportunities within ENP.

The implementation of the CEPP PACR alternatives may negatively affect some mammals dependent upon upland habitat. Due to increased water flow and changes in water distribution, it is anticipated that overdrained areas in the northern WCA 3A would be rehydrated, triggering a vegetation transition from upland to wetland habitat. Although mammals occurring within the area are adapted to the naturally fluctuating water levels in the Everglades, there is an increased potential for this vegetation transition to have a short-term, moderate, adverse, and unavoidable effect on some mammals using upland habitat for refugia and food source. For additional information on high water closures for mammals in WCA 3A, see **Appendix C.2.2.15.** High water is a concern for deer populations within northern WCA 3A that utilize tree islands. Deer and other upland wildlife species (e.g., bobcats, raccoons, and marsh rabbits) are mobile and will move in response to high water conditions from tree islands to higher ground, including levees. Habitat quality in these areas is generally less desirable and predation is greater, which results in increased mortality. No significant negative effects on mammals in the remainder of the project study area are anticipated under any of the alternatives.

5.1.7 Essential Fish Habitat

All alternatives move in the direction of reducing high-level freshwater discharges into the Northern Estuaries during the wet season, which will be beneficial to essential fish habitat (EFH).

5.1.8 Hydrology

A summary of the anticipated long-term hydrologic effects of the alternatives, which were described in **Section 3.3**, is presented in **Table 5.1-2**. A comprehensive discussion of the anticipated long-term hydrologic effects of the alternative actions is provided in **Section C.2.1.7** of **Appendix C.2.1**. The determination of the directionality of the long-term hydrologic change (improvements and/or adverse hydrologic change) within each specified geographic region is principally based on the results of the ecological evaluation, which are described in **Section 4.2.2**.

Table 5.1-2. Effects of CEPP PACR Alternatives on Hydrology

Geographic Region	FWO	With Project Conditions
Lake Okeechobee	Moderate hydrologic change, with improvements from reducing the frequency of low lake stages and adverse effect from increasing the frequency of high lake stages. Significant stage increase of 0.25-0.50 ft for the upper 70% of the stage duration curve, excluding extreme wet hydrologic conditions. Number of days with stages above 16 ft NGVD is increased from 768 to 1,163 during the 1965-2005 period of simulation.	Minimal hydrologic change, with improvements from reducing the frequency of lake stages near the top of the beneficial range and from further reducing frequency of extreme low stages. A minor adverse effect from slightly increasing the frequency of extreme high lake stages. A minor adverse effect from decreasing the frequency of low lake stages in the lower portion of the beneficial range.
Northern Estuaries	**Caloosahatchee Estuary:** Moderate improvement. Mean monthly flows above 2,800 cubic feet per second (cfs) and 4,500 cfs are reduced by 11 months and 4 months, respectively (14% and 12% reductions, respectively). Mean monthly flows less than 450 cfs are reduced by 4 months (15%). **St. Lucie Estuary:** Moderate to significant improvement. Mean monthly flows above 2,000 cfs and 3,000 cfs are reduced by 29 months and 7 months, respectively (34% and 23% reductions, respectively). Mean monthly flows less than 350 cfs are reduced by 27 months (29%). Additional analysis for Savings Clause requirements is provided in **Annex B**.	**Caloosahatchee Estuary:** Moderate additional improvement in mean monthly flows above 2,800 cfs are reduced from the FWO by 6 for Alternative R240, by 7 for Alternative R360 by 9 for Alternative C360. Minor additional improvement in mean monthly flows above 4,500 cfs are reduced from the FWO by 1 for R240, by 0 for R360, and by 1 for C360. Mean monthly flows less than 450 cfs increase by 1-4 for the alternatives. **St. Lucie Estuary:** Minor additional improvements in 14-day moving average flows above 2000 cfs were reduced by 4 for Alternative R240, by 6 for Alternative R360, and by 4 for Alternative C360. Minor additional improvement in mean monthly flows above 3,000 cfs occurred. They were reduced by 1 for R240, by 2 for R360, and by 2 for C360**.** Mean monthly flows below 350 cfs increased by 3 for R240, by 2 for R360, and by 1 for C360**.**
Greater Everglades: WCA 2A and WCA 2B	**WCA 2A (2A-17)**: Moderate improvement. Stages are decreased by 0.1-0.3 ft under all hydrologic conditions. **WCA 2B (2B-Y)**: Moderate adverse effect. Stages are decreased by 0.50-0.75 ft under nearly all hydrologic conditions, excluding extreme wet conditions.	**WCA 2A Overland Flow (Transect 2)**: Moderate Improvement. General increase in flow during the dry season of 18,000-29,000 ac-ft compared to the FWO. No differences with the FWO during the wet season. **WCA 2B Overland Flow (Transect 4)**: Flow during the dry and wet seasons are the same as the FWO.

Table 5.1-2. Effects of CEPP PACR Alternatives on Hydrology (continued)

Geographic Region	FWO	With Project Conditions
Greater Everglades: WCA 3A and WCA 3B	a) **L-28 Triangle**: Minor improvement. Stages increased by 0.1-0.2 ft during all hydrologic conditions, excluding extreme wet conditions. b) **Northwest WCA 3A (3A-NW)**: Major improvement. Stages are generally significantly increased by 0.6-0.8 ft. c) **Northeast WCA 3A (3A-NE)**: Major improvement. Stages are increased by 0.4-0.7 ft, with no significant change during extreme wet conditions and a slight increase in stage for extreme dry conditions. d) **East-Central WCA 3A (3A-3)**: Major improvement. Stages are generally increased by 0.2-0.5 ft, with no significant change during the wettest 20% of conditions. e) **Central WCA 3A (3A-4)**: Minor to moderate favorable effect. Stages are generally increased by 0.1-0.2 ft during average to dry conditions, with a slight depth reduction during the wettest 10% of conditions and no significant change during extreme dry conditions. f) **Southern WCA 3A (3A-28)**: Minor favorable effect. Stages are decreased by 0.1-0.2 ft during the wettest 5% of conditions and slightly decreased during normal to dry conditions. g) **WCA 3B (Site 71)**: Moderate to major improvement. Stages are increased under all hydrologic conditions, including stage increases of 0.1 ft during the upper 20% of the stage duration curve (normal to extreme wet conditions), stage increases of 0.2-0.3 ft for normal to dry conditions, and a slight stage increase during extreme dry conditions.	a) **L-28 Triangle**: No effect. b) **Northwest WCA 3A (3A-NW)**: Minor beneficial effect. Stages increased by less than a 0.1 ft throughout the entire duration range. c) **Northeast WCA 3A (3A-NE)**: Minor beneficial effect. Stages increased by 0.1 ft with a little decrease during 30% dry conditions d) **East-Central WCA 3A (3A-3)**: Minor beneficial effect. Stages slightly increased by less than a 0.1 ft, with no significant change during the wettest 5% of conditions e) **Central WCA 3A (3A-4)**: Negligible effect. Stages experience a minor increase of less than a 0.1 ft during average conditions with no significant change during extreme dry and wet conditions f) **Southern WCA 3A (3A-28)**: Minor beneficial effect. Stages are decreased by 0.1-0.2 ft during the wettest 5% of conditions and slightly decreased during normal to dry conditions. g) **WCA 3B (Site 71)**: Negligible effect. Peak stages exceed 9.0 ft NGVD less than 1% of period of simulation

Table 5.1-2. Effects of CEPP PACR Alternatives on Hydrology (continued)

Geographic Region	FWO	With Project Conditions
Greater Everglades: ENP	a) **Northwest ENP (NP-201)**: Minor to moderate adverse effect. Stages are significantly decreased by 0.1-0.3 ft under both wet and dry hydrologic conditions; stages are slightly increased or unchanged for normal hydrologic conditions between approximately 35% and 55% on the stage duration curve. b) **Northeast ENP (NESRS-2)**: Major improvement. Stages are significantly increased by 0.5-0.9 ft under all hydrologic conditions. c) **Central ENP (P-33)**: Major improvement. Stages are increased by 0.2-0.4 ft under all hydrologic conditions. d) **Taylor Slough**: Minor adverse effect. Stages are slightly decreased by approximately 0.1 ft during the wettest 20% of hydrologic conditions and slightly increased by 0.1-0.2 ft during normal to dry hydrologic conditions.	a) **Northwest ENP (NP-201)**: Minor beneficial effects. Stages are increased by 0.1 ft during 30% wettest hydrologic conditions. b) **Northeast ENP (NESRS-2)**: Moderate beneficial effect. Even though stages are not significantly increased under all hydrologic conditions, the overland flow volumes did increase. c) **Central ENP (P-33)**: Moderate beneficial effect. Stages are slightly increased under 30% wettest hydrologic conditions. d) **Taylor Sloug**h: Minor beneficial effect. Stages are slightly increased by less than a 0.1 ft during the driest 50% of hydrologic conditions and a slight increase in overland flow.
Southern Estuaries	a) **Biscayne Bay**: Combined total average annual canal discharges to central and southern Biscayne Bay are increased by 17,000 ac-ft (15%). Average annual canal discharges to northern Biscayne Bay are reduced by 46,000 ac-ft (11%). b) **Florida Bay**: Moderate improvement. Combined average annual overland flows from Southern ENP to Florida Bay (Transect 23) are increased by 23,000 ac-ft (9%).	a) **Biscayne Bay**: Minor beneficial effects. Slight increase in freshwater flows to Biscayne Bay and Biscayne National Park. b) **Florida Bay**: Minor beneficial effects. Combined average annual overland flows from Southern ENP to Florida Bay (Transect 23) are increased by 6,000 ac-ft.

5.1.9 Water Quality

The assessment of project impacts to water quality is summarized in **Table 5.1-3** below. The detailed analyses are found in **Appendix C.1**, **Appendix C.2.1**, and **Appendix C.2.2** as well as **Annex F**.

Table 5.1-3. Effects of CEPP PACR Alternatives on Water Quality

Geographic Regions	FWO	With Project Conditions
Lake Okeechobee	Slight changes to operations not expected to result in significant WQ impacts; however, additional backflow into the lake at S-308 increases the annual phosphorus load slightly. Changes in phosphorus loads will be addressed holistically throughout the watershed via the Florida Department of Environmental Protection's Lake Okeechobee Basin Management Action Plan (BMAP) process (Section 403.067, Florida Statutes). The BMAP is currently under development via a public stakeholder driven process.	Relative to the FWO, no effect to lake water quality is expected.
Northern Estuaries	Number of low and high salinity events for Caloosahatchee and St. Lucie is reduced. Improved nutrient and dissolved oxygen conditions expected to result from reduced high flow events from Lake Okeechobee, improved Lake Okeechobee nutrient levels, and improved estuary basin runoff quality.	Minor beneficial effects to salinity, color, turbidity, nutrient, and dissolved oxygen conditions would be improved from existing conditions because of the reduced high flow events from Lake Okeechobee through implementation of CEPP. Relative to the FWO, the number of high flow events for the Caloosahatchee and St. Lucie Estuaries is reduced. The number of low-flow events increased slightly in both estuaries but could potentially be managed with improved operations of local basin reservoirs such as C-43 and the C-23/24 reservoirs.
EAA	Use of A-2 FEB lands in project will slightly reduce total basin nutrient loads. Otherwise similar to FWO. CEPP plan increases flows through the Central Flow path, but it also provides increased FEB storage. Based on DMSTA modeling, the additional FEB storage provided in the central flow path by CEPP, in combination with the A-1 FEB, STA-2, and STA-3/4, is sufficient to handle the additional CEPP flows (approximately 210 kac ft/yr) and still achieve the WQBEL. However, there are still uncertainties associated with treatment of CEPP flows using the existing conveyance features, STA facilities, and portion of A-1 FEB capacity. The CEPP adaptive management plan will address some of the uncertainties associated with operating the integrated A-1/A-2 FEB integrated system. It is expected that the A-2 FEB will accrete peat soils and capture carbon from the atmosphere.	All alternatives considered the need for additional STA to treat water from an EAA Storage Reservoir. DMSTA water quality modeling was performed, and STAs sized to ensure compliance with the WQBEL with increase flow.

Table 5.1-3. Effects of CEPP PACR Alternatives on Water Quality (continued)

Geographic Regions	FWO	With Project Conditions
Greater Everglades	**WCA 2**: Negligible effects. **WCA 3A**: Backfilling of northern portion of Miami Canal and re-direction of water into the northern marsh areas will result in greater uptake of nutrients and sulfate in northern WCA 3A. Increased flows and new flow patterns may result in increased water column phosphorus concentrations at one or more TP rule stations in the short term. The effect on TP rule compliance is likely to be minimal in the long term. Reduced incidence of dry out of the northern marsh should limit peat oxidation and nutrient re-mobilization. Lower phosphorus and sulfate concentrations should occur in southern WCA 3A. Redistribution of flows into the northern marsh and away from the Miami Canal may result in a change in locations of methylmercury "hotspots" identified as areas where methylmercury concentrations in fish are high. It is expected that the sawgrass prairie communities north of Alligator Alley will have a higher probability of succession which suggests positive peat soil accretion and carbon capture from the atmosphere. **WCA 3B**: Reduction in dry out events relative to FWO will result in reduced peat oxidation / remobilization of nutrients. Additional flows into WCA 3B through the S-631 structure may result in increased water column phosphorus concentrations at one or more TP rule stations in the short term; however, this should have minimal impact on TP rule compliance in the long term. **ENP**: It is uncertain how changes in flow distributions proposed under CEPP will impact compliance with Appendix A of the 1991 Settlement Agreement. Over the long-term, distributing the flow over the northern WCA 3A marsh, reducing short-circuiting down the canals to ENP, adding more flow from the lake that is treated to the WQBEL, and distributing these flows over the marsh should result in improvements by lowering the flow weighted mean total phosphorus concentration entering the Park. In the short-term, to address the uncertainty in compliance with Appendix A, the Technical Oversight Committee (TOC) is reviewing applicability of the current Appendix A compliance methodology for a restored ecosystem. Relative to FWO, no change to Settlement Agreement compliance for Taylor Slough is expected.	Negligible beneficial effects. Conditions in WCA 2, WCA 3A, WCA 3B, and ENP would be expected to be similar to the FWO.

Table 5.1-3. Effects of CEPP PACR Alternatives on Water Quality (continued)

Geographic Regions	FWO	With Project Conditions
Southern Estuaries	Improved salinity conditions relative to FWO condition. With-project mean salinity moves closer to the target with a 2 psu decrease in the bay's central zone and an average salinity decrease of 1.5 psu among all bay zones for wet and dry seasons. While this appears to be a small change, this grand mean of salinity improvement (over a simulated 36-year period) is still a major step toward the restoration target.	Minor beneficial effects to salinity. Other conditions would be similar to the FWO.

5.1.10 Air Quality

Comparison between the FWO and the alternatives results in minor beneficial effects with a decrease in dry events and subsequent fire incidence, which should improve air quality. Creation and rehydration of wetlands is expected to result in increased carbon dioxide (CO_2) sequestration through peat accretion. All environmental air permits will be acquired to ensure all air quality standards are met for proposed pump stations.

5.1.11 Hazardous, Toxic and Radioactive Waste

As compared to the FWO, the A-2 and A-2 Expansion area lands are to be converted to either reservoir or STA with the necessary associated project components. Potential for new hazardous, toxic, and radioactive waste (HTRW) or pesticide applications to soils is reduced relative to the FWO condition for all alternatives. The expanded HTRW assessment is found in **Appendix C.1 and C.2.2**. HTRW reports and correspondence found in **Annex H** assessed the lands for the A-2 FEB, which are the same lands to become the A-2 Reservoir under the TSP. The residual agricultural chemical policy assessment is found in **Appendix C.2.2**.

5.1.12 Noise

All action alternatives would result in minor and short-term increases in noise during construction as compared with the FWO and a less than significant effect. All action alternatives include construction of additional pump stations which would result in long-term, negligible increases in noise, which is expected to be less in comparison to current ongoing noise associated with agricultural equipment use in the agricultural fields. Alternative R360D would have the greatest effect with the addition of two pump stations.

5.1.13 Aesthetics

Short- and long-term minor adverse effects to aesthetics would be expected from the storage and treatment components and the conveyance improvements from both the R240 and R360 alternatives.

Lake Okeechobee operations, under both the R240 and the R360 alternatives, would have long-term minor beneficial effects to aesthetics in the overall study area by improving ecological conditions.

The reservoir would reduce high-volume discharges into the Northern Estuaries resulting in lower suspended solids, increased water clarity, and better maintenance of healthy SAV beds. These beneficial effects would somewhat offset any minor adverse effects from the storage and treatment components and the conveyance improvements.

Short-term effects would be due to the use of heavy equipment during the construction of the reservoir and supporting infrastructure, and along the canals undergoing improvements. Long-term effects would be due to the establishment of a permanent man-made reservoir and STA supporting infrastructure.

The additional increase in water flow to the south would improve the ecological structure, which in turn would improve aesthetic values in southern Florida when compared to the FWO. Although natural areas in southern Florida would continue to be comprised of wetlands, sawgrass marshes, wet prairies, and tree islands, there would be an improved aesthetic value due to re-establishment of hydropatterns and sheetflow throughout the region.

A detailed description of the aesthetics for these areas that would potentially be affected by the proposed action is included in **Appendix C.1** and **Appendix C.2**.

5.1.14 Land Use

The only changes resulting in significant long-term land use change are the lands being converted from agricultural use to project features. The A-2 Expansion area includes 4,155 acres currently used for agriculture that would be converted to an STA or a deep storage reservoir. Of the 4,155 acres in the A-2 Expansion area, 500 acres are currently privately owned, with the remainder under public ownership.

5.1.14.1 Wetlands

For all alternatives, almost all the future development within the study area is expected to occur on lands that are currently or formerly used for agriculture. However, Alternatives R240A and R240B would shift 4,155 acres from agricultural land use with wetland soils to higher quality wetlands with the conversion of the A-2 Expansion area from sugarcane to an STA. All alternatives add higher quality wetland habitat and improved functionality adjacent to the Greater Everglades.

5.1.14.2 Agriculture

The project features would be placed on 4,155 acres that is currently used to cultivate sugarcane. The proposed project alternatives minimize the impacts to agricultural lands while maximizing ecological benefits in a cost-effective manner. In addition, an evaluation has been conducted on the South Dade conveyance system to ensure that existing levels of flood control would be maintained to support agricultural operations in Miami-Dade County. Apart from the conversion of 4,155 acres within the A-2 Expansion area, the alternatives would be expected to have negligible effect on agriculture relative to FWO conditions.

Coordination with the USDA and NRCS to meet the requirements of the Farmland Protection Policy Act, will occur. When detailed design information that locates each of the plan components is completed, it can then be determined how many acres of unique farmland would be affected by the Project. (Refer to **Appendix C.4.10**).

5.1.15 Socioeconomics

Congress enacted the 1996 Federal Agriculture Improvement and Reform Act (Farm Bill) and provided funds on April 4, 1996 (P.L. 104-127, 110 Statute 1022). Under Section 390 of the Farm Bill, the Secretary of the Interior was authorized to use funds made available to conduct restoration activities in the Everglades ecosystem in south Florida, including but not limited to the acquisition of real property and interests in real property located within the Everglades ecosystem. The Farm Bill provided that the Secretary of the Interior could transfer funds to the USACE, the State of Florida, or the SFWMD to conduct the aforementioned restoration activities. The A-2 parcel was purchased with Farm Bill funding. The loss of agricultural production in the EAA and potential effects on socioeconomic conditions and low income/minority populations were addressed during the land acquisition. CEPP and CEPP PACR do not present any environmental impacts that are high, adverse, and disproportionate to low income or minority populations.

There would be minor beneficial improvements to Lake Okeechobee commercial navigation with this project. There would be a reduced frequency and duration of low and extremely low lake stage events, which would provide an improved condition for commercial navigability in the lake. Additional information and documentation of the CEPP PACR recommended plan modeling assumptions for Lake Okeechobee operations are found in **Appendix A**. The authorized C&SF project depths for Lake Okeechobee navigation are based on 12.56 ft NGVD.

5.1.15.1 Population

The population within the eight counties (Lee, St. Lucie, Martin, Hendry, Palm Beach, Broward, Miami-Dade and Monroe) that are most likely to be impacted by the project features is expected to increase from 7,185,700 to 9,552,500, or by 33%, from 2016 to 2045, with Broward and Miami-Dade counties attracting the greatest number of new residents. Monroe County is expected to experience a small reduction in permanent residents over the next 20 years. When aggregated, the total population is projected to increase by 2.36 million people. This is a slower rate of growth than projected previously in CERP planning efforts. Population projections are not anticipated to differ between the FWO and alternative conditions.

5.1.15.2 Water Supply and Flood Control

A summary of the anticipated long-term effects on water supply and flood control of the alternatives is compared with the FWO in **Table 5.1-4**. Based on the period of simulation analysis for the alternatives, the project modifications maintain the pre-project levels of service for flood control and water supply consistent with the requirements of the WRDA 2000 and Chapter 373.1501.

Table 5.1-4. Effects of CEPP PACR Alternatives on Water Supply and Flood Control

Geographic Region	FWO	With Project Conditions
Lake Okeechobee	Minor to moderate improvement. Mean annual EAA water supply demands not met are decreased from 8% to 6%. Lake Okeechobee Service Area (LOSA) water supply cutback percentage is increased for 1 of the 8 years with the largest water supply cutbacks.	Minor improvement. Compared to the FWO, mean annual EAA water supply demands not met are decreased from 6% to 4%. LOSA water supply cutback percentage is decreased from 4% to 3%. LOSA water supply cutback severity, magnitude and duration is improved when compared to the FWO for all of the 8 worst years in the period of record (POR).
Greater Everglades	Moderate flood control improvement. The frequency of WCA 3A stages within Zone A of the Regulation Schedule is moderately increased from 18% to 22% of the 1965-2005 period of simulation. Stages within the wettest 10% of hydrologic conditions, however, are generally reduced by 0.2-0.3 ft.	Moderate flood control improvement. Compared to the FWO, the frequency of WCA 3A stages within Zone A of the Regulation Schedule is moderately increased from up to 22% up to 26% of the 1965-2005 period of simulation.

Table 5.1-4. Effects of CEPP PACR Alternatives on Water Supply and Flood Control (continued)

Geographic Region	FWO	With Project Conditions
Lower East Coast Service Area 2 (Broward)	Negligible. No change in the number of water years with three or more consecutive months with restrictions. No significant changes to local ground water levels which are prevalent through normal to dry hydrologic conditions. An additional 12 million gallons per day is provided for the LECSA 2 to meet demand.	No change from FWO.
Lower East Coast Service Area 3 (Miami-Dade)	Moderate improvement for water supply and flood control, with no anticipated adverse effects. a) Decrease of 3 water years with 3 or more consecutive months with restrictions. b) L-30 Canal stages are increased by 0.1-0.6 ft for normal to extreme dry conditions; moderate reduction of 0.1-0.2 ft for flood control stages within the wettest 10% of the hydrologic conditions, with no significant change observed for the upper 1% of the stage duration curve. c) L-31N canal stages are increased by -.0-0.2 ft during dry conditions; significant reduction to flood control stages within the wettest 5% of hydrologic conditions. Reduced stages are indicated during the driest 5% of hydrologic conditions for area east of L-31N and south of the 8.5 SMA. d) No significant changes to C-111 canal stages between S-176 and S-18C during normal to dry hydrologic conditions, with a 0.1-0.2-ft increase during normal hydrologic conditions; no significant change to flood control stages within the upper 10% of the stage duration curve. e) Minor increase to stages in the wettest 10% of the hydrologic conditions for areas immediately east of Pennsuco, with stage increases of less than 0.20 ft. f) An additional 5 MGD is provided for LECSA 3 to meet demand.	No change from FWO for water supply. Negligible effects on flood control.

5.1.15.3 Recreation

For the CEPP PACR alternatives, the overall trend is an improvement in recreational benefits. Effects on recreation facilities and activities in Lake Okeechobee, Northern Estuaries, and the Greater Everglades resulting from the CEPP PACR alternatives are compared to the FWO in **Table 5.1-5** with additional details provided in **Appendix C.2.1.15** and a description of when closures occur in the Everglades Wildlife Management Area (EWMA) is included in **Table 5.1-6** and **Appendix C.2.1.15.**

Table 5.1-5. Effects of CEPP PACR Alternatives on Recreation

Geographic Regions	FWO	With Project Conditions
Lake Okeechobee	No Effect. There is no impact to recreational navigation.	Minor improvements for all Alternatives based on improved recreational navigation opportunities.
Northern Estuaries	Reductions in extremely high flows to the estuaries that currently damage fisheries habitat would provide minor and less than significant beneficial effects by enhancing utilization of the estuaries by fish and subsequently improve related recreational opportunities such as fishing, boating and kayaking.	Minor additional beneficial effects on recreation from further reductions in high flows to the estuaries resulting from the CEPP PACR would continue to improve estuarine conditions by further reducing high flows to the estuaries. This improvement would further increase and enhance utilization of estuaries by fish and subsequently improve related recreational opportunities such as fishing, boating, and kayaking.
EAA	The FEB feature will add approximately 14,000 acres of recreational opportunities and recreation features similar to those in the Greater Everglades, providing a minor and less than significant beneficial effect.	Moderate beneficial recreation effects due to the STA and reservoir features would provide increased recreational opportunities including, but not limited to, fishing, sightseeing, hunting, hiking, biking, and bird watching.
Greater Everglades	Improved hydrology will enhance wildlife populations through improved survival and reproduction, subsequently resulting in a minor and less than significant beneficial effect for outdoor recreation opportunities. Proposed facilities will enhance the public's ability to access into and within the Greater Everglades. Increased hydration in the very northern WCA 3A areas that have been drier could have a short-term significant, adverse and unavoidable effect on hunting (deer, hog, and rabbit). Conversely, a long term major significant benefit occurs due to increased fire protection for the peat soils, thus diminishing the potential for loss of this same area. Alts 4R and 4R2 incorporate the least negative effect on Northern WCA 3A mammal hunting opportunities. In these northern dry areas public access is often limited to track vehicles; rehydration will increase public access through improved conditions favorable to airboats. Access for recreational fishing by power boat will have a major and adverse	Improved hydrology will enhance wildlife populations through improved survival and reproduction, subsequently resulting in a minor and less than significant beneficial effect for outdoor recreation opportunities. Increased hydration in the very northern WCA 3A areas that have been drier could have a short-term significant, adverse and unavoidable effect on hunting (deer, hog, and rabbit). A slight increase in days of low water closures is a minor increase in risk of peat soil fires. In these northern dry areas, public access is often limited to track vehicles; the minor increase in low water closures would minimally decrease public access favorable to airboat uses.

Table 5.1-5. Effects of CEPP PACR Alternatives on Recreation (continued)

Geographic Regions	FWO	With Project Conditions
	significant effect through backfilling the Miami Canal. This affects 14 of the 33 miles of the Miami Canal in the WCA 3. Fishing opportunities throughout the Greater Everglades will have a major beneficial effect by the improvements in boat access and the addition of access points around proposed structures. The removal of the L-29 levee will create a marsh connection to L-29 canal and enhance fishing in this canal. Improved trail heads for access and designation of blue and greenway trails will be positive. The Blue Shanty Levee will bisect L-67C. Recreational fishing by prop boat to the northern end of L67C canal would continue to be available from a new public boat ramp located in the northern end of L67C at the S151, providing a minor and less than significant beneficial effect. Also at the S151 a new public boat ramp will allow access into the northern 5 miles of the Miami Canal south of S151 not previously served by a public boat ramp. The Blue Shanty levee will have an airboat crossing, at full height, so as to not bisect the airboat use within WCA 3B. A boat ramp will be added near S-333 to provide access to the L-29 canal so the L-29 divide structure does not prevent boat access. The L-29 divide structure will also serve as a pedestrian and vehicle access to the remaining L-29. The Blue Shanty Levee will serve as reroute connection for greenways trail users when the L-29 levee is removed to ensure contiguous connection east to west between S333 and S334.	

Table 5.1-5. Effects of CEPP PACR Alternatives on Recreation (continued)

Geographic Regions	FWO	With Project Conditions
EWMA	High and low water closures already exist. High water closures diminish access to camps and close portions or all of a hunting season. Low water closures also restrict access to camps and while these do not occur during the hunting season this condition leaves peat soils at a higher risk of fire, effecting future recreation negatively if a fire causes a loss of habitat.	Negligible increases in the number of days of high water closures during hunting seasons occur in years where a closure during that hunting season would be expected during the FWO, with the exception of one occasion for two weeks in the POR.
Southern Estuaries	Access to the Southern Estuaries would not change based on CEPP, however, increase in flows to Florida Bay would enhance fish populations and subsequently improve related recreational opportunities such as fishing, boating and kayaking, providing a minor beneficial effect.	Negligible effects on recreation would occur in the Southern Estuaries

Table 5.1-6. Closures over the Period of Record (POR) in the EWMA comparing the FWO and CEPP PACR Alternatives

	High Stage Closures over POR (2-gauge avg. > 11.6 ft)			Fire Closures over POR (2-gauge avg. <= 9.16 ft)			Total High Water and Low Water Closures			
Alternative	Closure Days	Closure Events	Avg. Closure Duration (Days)	Closure Days	Closure Events	Avg. Closure Duration (Days)	Closure Days	Closure Events	Avg. Closure Duration (Days)	% of POR-closure
EARFWO	614	18	34.1	203	9	22.6	817	27	30.3	5.5%
R240A R240B	698	20	34.9	219	7	31.3	917	27	34.0	6.1%
R360C R360D	703	24	29.3	217	7	31.0	920	31	29.7	6.1%
C360C	710	25	28.4	215	7	30.7	925	32	28.9	6.2%

Notes:
* 2 Gage average is based on cells WCA 3A-2 and WCA 3A-3.
* 3A-2 and 3A-3 average ground surface elevation = 9.66 ft NGVD (Closure threshold is 2-gage average < 9.16)

5.1.16 Cultural Resources

Effects to cultural resources for the CEPP PACR alternatives are presented in **Table 5.1-7.** Criteria used to evaluate the alternatives are found in **Appendix C.2**. A description of full preliminary analysis, background information and descriptions of terms are presented in **Appendix C.2 (Section C.2.1.17)**.

In conjunction with the National Historic Preservation Act (NHPA), formal consultation would be initiated with the Seminole Tribe of Florida's Tribal Historic Preservation Office (THPO); the Miccosukee Tribe of Indians of Florida's NAGPRA Representative; the Florida State Historic Preservation Office (SHPO); and the Florida Bureau of Archaeological Research after the report is submitted to the ASA(CW). Formal consultation would determine if additional surveys may be needed, specifically during the PED phase, when feature designs are finalized and construction staging areas are identified.

Section 106 compliance with the NHPA would be conducted separately from NEPA and would not be completed during the current feasibility phase of the project; however, it would be completed prior to construction of each feature. For consideration under the NHPA, determinations of potential effects and mitigation of those effects on cultural resources listed in **Table 5.1-7** are preliminary and should not be considered final.

Table 5.1-7. Effects of Alternatives on Cultural Resources

Cultural Resources (Please refer to Cultural Resources in Appendix C.2.1 for further details)		
Geographic Regions	**FWO**	**With Project Conditions**
Lake Okeechobee	No effect on cultural resources.	
Northern Estuaries	No effect on cultural resource.	
EAA, including Associated Canals and Structures	Long-term adverse effect on cultural resources 8PB16039 and 8PB16040.	Consistent with the FWO, major long-term adverse effects on cultural resources sites 8PB16039 and 8PM16040. Mitigation of effects for historic property 8PB16039 potentially reduced to no effect. Mitigation of effects for culturally significant site 8PM16040 is unknown. Additional cultural resource surveys are needed on the A-2 Expansion area to determine if culturally significant sites exist.

Pursuant to 36 CFR 800.1, where possible, the project design will be modified to avoid impacting significant historic properties and culturally significant sites. Where avoidance is not possible, other mitigation measures will be considered, which could include but are not limited to data recovery excavations. The mitigation measures will be developed in consultation with SHPO, tribal groups, and other interested parties as established in implementing regulations for Section 106 of the NHPA.

The use of the term "cultural resources" includes historic properties that are eligible or potentially eligible for National Register of Historic Places (NRHP) listing, and culturally significant sites. For definitions of terms, see **Section 10**.

5.1.17 Invasive Species

All CEPP PACR action alternatives would have negligible effect for establishment and spread of non-native invasive and native nuisance species, similar to the FWO. A more detailed description of the effects the alternatives is provided in **Appendix C.2.1.18**. Disturbed areas resulting from construction are likely to temporarily influence the recruitment of non-native invasive and native nuisance species. The large number of existing and potential invasive plant and animal species and the often incomplete knowledge of invasive mechanisms for each species create moderate uncertainty in this evaluation. Long-term monitoring in an adaptive management framework is critical to ensure efficient management of the most threatening non-native invasive species in the affected area. Proposed management activities to address invasive species are provided in **Annex G**.

5.2 EFFECTS OF THE TENTATIVELY SELECTED PLAN

Analysis of all CEPP PACR alternatives identified Alternatives R240A and C360C as best buys. Further consideration described in **Section 4.0** identified the TSP to be carried forward for further analysis. This assessment of environmental effects evaluates the anticipated environmental effects of the TSP described in **Section 4.6**. The evaluation of best performing alternatives identified the need to revise the operations of Alternatives R240A to “C240A” (the TSP) to gain additional ecological benefits, to ensure the project Savings Clause constraints are met, to minimize localized adverse ecological effects, and to identify additional opportunities to provide for other water-related needs. The TSP was compared to and evaluated against the FWO (the No Action Alternative under NEPA) to describe changes that would be expected with implementation of the TSP. These potential effects are summarized within this section.

The ecological model used to develop habitat units and assess project benefits is not sensitive to the magnitude of additional restoration flows made available by the TSP. However, additional restoration flow provided by the TSP is critical to the goals of Everglades Restoration. The flows provide an additional increment towards the restoration of the Everglades by increasing velocity through the marshes contributing to better formation of the historical ridge and slough system, reducing damaging peat fires and improving salinities at near-shore locations of Florida Bay. The TSP is the next increment of CERP and, when compared with the FWO which has other authorized projects including CEPP, the benefits it alone provides are modest but very important in moving CERP one step closer to achieving CERP goals. The CEPP PACR is different than many planning documents where the FWO is typically a “do nothing” scenario. Due to the numerous restoration projects that are included in the FWO there is a significant improvement in ecological and hydrologic conditions expected from the completion of other authorized projects. Details regarding significant or nonsignificant effects are provided within this section and full details are discussed in **Appendix C.2.2**. The same definitions described in **Section 5.1** were used to evaluate the context, intensity, duration, and cumulative nature of impacts associated with the TSP.

5.2.1 Climate

Implementation of the TSP would have similar effects on climate as the FWO.

5.2.2 Geology and Soils

The TSP would result in conversion of the CEPP A-2 FEB to an above-ground storage reservoir with an additional STA. Reduction in sediment and silt would have minor beneficial effects on the Northern Estuaries. In the southern portion of the EAA, conversion of agricultural lands to storage and treatment wetlands would have a moderate beneficial effect to soils within the project footprint by reducing dry condition-based soil subsidence. Moderately improved hydroperiods and sheetflow in the northern regions of WCA 3A would be expected to reduce soil oxidation, which would, in turn, promote peat accretion necessary to rebuild the complex mosaic of habitats across the landscape. Minor hydroperiod improvements to the rest of the Greater Everglades would have a negligible effect on soil oxidation. The TSP would have a minor increase in inundation duration over the FWO that would decrease soil oxidation, subsidence, and peat fires, and increase carbon sequestration. The TSP showed minor improved hydrologic conditions in the northern WCA 3A, especially in the northwest (see **Appendix G, Table G-21** and **Table G-22**). Consistent with its effect on other regions of the Greater Everglades, the TSP scored equal to or slightly higher than the FWO in meeting the desired targets for measures of inundation duration, drought intensity, and slough vegetation suitability (see **Appendix G, Table G-21** through **Table G-29**).

5.2.3 Vegetation

The TSP would reduce the frequency and duration of low and extremely low lake stages in Lake Okeechobee, and slightly increase the frequency and duration of extreme high lake stages. Additionally, lake stages in the mid- to lower-portions of the beneficial envelope (12.5 to 15.5 ft NGVD) would occur less frequently with the TSP. Overall, however, lake stages would be within the beneficial range more often with the TSP relative to FWO. Additionally, the TSP shows performance improvement within the Northern Estuaries as indicated by fewer high-volume flow months and less frequent damaging events providing a moderate beneficial effect. Reduction in return frequencies, high flows, and accompanying flow velocities would result in lower suspended solids, color, and colored dissolved organic matter, thereby allowing greater light penetration to promote growth of SAV.

Conversion of sugar cane agricultural fields to freshwater wetlands on the A-2 Expansion area would provide additional benefit of carbon sequestration. Refer to **Appendix C.2.1** for a detailed comparison of potential effects to vegetation.

As compared with the FWO, mangrove communities and seagrass beds associated with the Northern Estuaries would likely show a moderate and long-term benefit with the TSP from reduction in high flows, and accompanying flow velocities would result in lower suspended solid loading and decreased concentration of colored dissolved organic matter, thereby allowing greater light penetration to promote growth of SAV. Refer to **Appendix C.2.2** for a detailed comparison of potential effects to vegetation.

Due to changes in the quantity, quality, distribution and timing of water entering the Greater Everglades ecosystem, long-term and minor effects on wetland hydrology and vegetation would potentially occur with implementation of the TSP. The TSP distributes almost all of its additional water through the CEPP-designed L-4 spreader canal across the northern WCA 3A, thereby increasing hydroperiods and depths within this area more than any other area. CEPP PACR implementation of the TSP would act to increase the hydration of northern WCA 3A, especially northwest WCA 3A, promoting peat accretion, reducing the potential for high intensity fires and promoting transition from upland to wetland vegetation. The CEPP PACR TSP provides moderate improvements to the low-depth (0.0-1.0-ft) hydroperiods in WCA 2A compared to FWO, but does nothing to decrease the duration of ponding depths below 0.0 ft and would slightly increase the duration of the high-depth (1.0–2.5- ft) hydroperiods (**Appendix C.2, Figure C.2.2-31**). Essentially, there is very little difference between the FWO and the TSP for WCA 2A. There is no difference between the TSP and the FWO on the environmental impacts of the hydrology in WCA 2B (**Appendix C.2, Figure C.2.2-32**).

Vegetation and patterning in the central portion of WCA 3A resembles pre-drainage conditions most closely and represents some of the best examples of remnant Everglades habitat in south Florida. The TSP would preserve these pre-drainage characteristics.

The northwestern WCA 3A is the only region in the Greater Everglades where the TSP would have a long-term, moderate beneficial effect to the vegetation. The routing of flows through the northwest portion of WCA 3A in the FWO may result in the expansion of cattail vegetation due to increasing nutrient loads. There is the potential for this loading to continue with this TSP and it is difficult to know exactly how the northwest region vegetation would respond to the increase flows associated with this TSP. That is why the Adaptive Management Plan for this TSP (**Annex D**) is mostly focused upon vegetation management in northwestern WCA 3A.

In southern WCA 3A, high water levels during the wet season are important in maintaining quality wet prairie and emergent slough habitat (USFWS 2010). However, current prolonged high-water levels (i.e., during both wet and dry season) and extended hydroperiods have resulted in vegetation shifts within southern WCA 3A, negatively impacting tree islands and fragmenting sawgrass ridges, resulting in the loss of historic landscape patterning. The TSP would not provide significant benefits to southern WCA 3A through reduction in high water levels or duration; therefore, significant shifts in vegetation are not anticipated within this region.

Flows through NESRS under current system compartmentalization and water management practices are greatly reduced when compared with pre-drainage conditions. The result has been lower wet season depths and more frequent and severe dry downs in sloughs and reduction in extent of shallow water edges. Over-drainage in the peripheral wetlands along the eastern flank of NESRS has resulted in shifts in community composition, invasion by exotic woody species, and increased susceptibility to fire. Implementation of CEPP PACR is expected to slightly continue the benefit of rehydration of NESRS by increasing the average annual overland flow to NESRS (Transect 18) by some 40,000 ac-ft compared to the FWO, providing long-term moderate environmental benefits. Resumption of sheetflow and related patterns of hydroperiod extension will significantly help to restore pre-drainage patterns of water depths and the complex mosaic of Everglades' vegetation communities.

Reduction in the number and duration of dry events in NESRS is a major environmental benefit because extended hydroperiods will reduce soil oxidation, decrease fire potential, promote peat accretion, and aid in restoration of historic wetland vegetation communities. A count of the ability of the TSP to decrease the duration of dry events, calculated for the driest of years (1972, 1980, 1981, 1987, 1989, 1993), was 11 weeks and was no different from the average duration of dry events for the FWO.

There is a long term, moderate to minor increase in the overland flow rates in NESRS and Taylor Slough, respectively. Such flows can reduce coastal salinities and maintain hydrological and ecological connectivity. Overland flows also help to maintain the ridge-slough patterns in all of SRS. Average annual increase in sheetflow across Transect 27 in SRS is increased by 68,000 ac-ft. The average annual sheetflow across Transect 23B in Taylor Slough is increased by 3,000 ac-ft as compared to the FWO.

The Everglades, a phosphorus-limited system, historically received most inputs of phosphorus through rainfall, with average TP concentrations of less than 0.01 milligrams per liter (mg/L) (McCormick et al. 1996, Newman et al. 2004). Recent data shows that all areas within ENP, including NESRS, have TP concentrations less than of 0.01 mg/L (SFWMD 2017 SFER). Any additional inputs resulting from implementation of the TSP (refer to **Section 5.2.9, Water Quality** for details) have the potential to result in vegetation changes within NESRS. Vegetation that can assimilate nutrients directly from the water column appears to be the most sensitive to nutrient enrichment and include periphyton and floating-leaved plants, such as spatterdock and water lily (Chaing et al. 2000, Newman et al. 2004). Potential effects on vegetation and species community composition within NESRS and ENP cannot fully be determined at this time. Water quality within the CEPP PACR study area will continue to be monitored, as described in the Water Quality and Adaptive Management sections in **Annex D**.

5.2.4 Threatened and Endangered Species

Conversion of agricultural land to above-ground reservoirs or stormwater treatment areas has the potential to result in desirable habitat for both Federally- and State-listed species. As such, operations of proposed CEPP PACR facilities have the potential to impact Federally- and State-listed species. However, constraining operations due to listed species that are attracted to the facilities will impact the ability of the facilities to achieve their projected regional benefits. As such, coordination with the Federal and State agencies charged with enforcing laws and regulations related to listed species will need to occur to ensure project objectives are maximized and impacts to listed species are avoided or minimized. Threatened and endangered species anticipated to be affected by the project are discussed below. Other species are discussed further in **Appendix C.2.2.4** and within the Biological Assessment in **Annex A.**

For the authorized CEPP project, the USACE entered formal consultation with USFWS on the Everglade snail kite (*Rostrhamus sociablis plumbeus*), and its designated critical habitat, CSSS (*Ammodramus maritimus mirabilis*) and its designated critical habitat, wood stork (*Mycteria americana*), and Eastern indigo snake (*Drymarchon corais couperi*). A Programmatic Biological Opinion was received from USFWS on April 9, 2014, which clearly states that further consultation will be needed when more specific project details are finalized during PED. While this document does not authorize incidental take of three endangered avian species (CSSS, snail kite, and wood stork), it does describe the anticipated effects based on current information. Upon completing ESA Section 7 consultation for each Project Partnership Agreement for the authorized CEPP project, USACE will undertake the agreed-to avoidance and minimization measures and implementing terms and conditions (TCs). When USACE is closer to constructing phases of CEPP that will affect listed species, USFWS will provide separate consultation document(s) which may authorize incidental take, and provide applicable reasonable and prudent measures (RPMs) and TCs.

The preliminary conclusion is that the authorized CEPP project is not likely to jeopardize the continued existence of the species listed above and not likely to adversely modify critical habitat, where designated. The USFWS Programmatic Biological Opinion for the authorized CEPP project concurred on the USACE's determination of may affect, but not likely to adversely affect the Florida panther (*Puma concolor coryi*), West Indian manatee (*Trichechus manatus*) and its critical habitat, American crocodile (*Crocodylus acutus*) and its critical habitat, deltoid spurge (*Chamaesyce deltoidea* ssp. *deltoidea*), Garber's spurge (*Chamaesyce garberii*), Small's milkpea (*Galactia smallii*), and tiny polygala (*Polygala smallii*). Furthermore, the USFWS concurred with all the "No Effect" determinations made by the USACE regarding the applicable threatened or endangered species that are found in the authorized CEPP project action area. The National Marine Fisheries Service provided a Programmatic Biological Opinion for the CERP to the USACE on December 17, 2013 and concurred with the "No Effect" determinations for the authorized CEPP project for the species under their purview.

For the purposes of the CEPP PACR, coordination for threatened and endangered species will occur after the report has been submitted to the ASA(CW). Effect determination on protected species should not change. Further consultation will be required before the CEPP PACR is authorized.

5.2.4.1 American Alligator

A keystone species within the Everglades ecosystem, the American alligator (*Alligator mississippiensis*), is dependent on spatial and temporal patterns of water fluctuations that affect courtship and mating, nesting, and habitat use (Brandt and Mazzotti 2000). Due to rehydration and decreased salinity of previously drained areas, particularly in the northern WCA 3A and ENP, it is anticipated that implementation of the TSP would moderately improve alligator habitat suitability as compared to the FWO and provide a minor beneficial effect. The conversion of agricultural lands to freshwater wetlands and storage features would have a moderate beneficial effect on alligators.

5.2.4.2 American Crocodile

The TSP would slightly increase freshwater flows, ultimately reducing salinity fluctuations, which would be expected to provide minor beneficial effects and improve habitat suitability for the American crocodile.

5.2.4.3 Everglade Snail Kite

The Everglade snail kite has a highly specialized diet typically composed of apple snails, which are found in palustrine, emergent, long-hydroperiod wetlands. As a result, the snail kite's survival is directly dependent on the hydrology and water quality of its habitat (USFWS 1999). As compared to the FWO, minor increases in stages in northwestern WCA 3A, as well as conversion of agriculture land to freshwater wetlands and reduced frequency and duration in low lake stages on Lake Okeechobee, would increase habitat suitable for apple snails. Although it is expected that the increase in apple snails will likely consist of exotic species, snail kite utilize exotic species as well as native species of apple snail. The anticipated increase in apple snail foraging by snail kites also is dependent on the presence and availability of open sloughs. The TSP would increase the spatial extent of suitable foraging opportunities for snail kites, providing a minor beneficial effect.

However, Everglade snail kite designated critical habitat (emergent aquatic vegetation) within Lake Okeechobee, WCA 1, or WCA 2 would not be affected by the TSP.

5.2.4.4 Cape Sable Seaside Sparrow (Nesting Condition and Hydroperiod)

The incremental effects of the minor increase in hydroperiod durations are anticipated to cause a minor to moderate negative effect to the CSSS nesting pattern as compared to the FWO, accept for sub-population F which shows a moderate negative effect. However, the mitigation efforts from the adverse effects created by the FWO would be expected to continue for the TSP (refer to **Appendix C.2.2.4.2, Table C.2.2-5** and **Annex D**).

5.2.4.5 Wood Stork

An analysis by the South Florida Natural Resources Center (Beerens 2013) of wood stork foraging potential was done for CEPP to evaluate and predict improvements to foraging habitat. Results from this analysis indicated improved foraging conditions in Northern WCA 3A, WCA 3B, and ENP due to improved fish abundance, vegetation and hydrology. Although the Beerens (2013) model is not available for this evaluation, the TSP hydroperiods would be indicative of a long-term but minor improvement in the foraging conditions in the northeastern WCA 3A and in the western regions of ENP (**Appendix C.2.2.4.3**, **Figure C.2.2-13** and **Figure C.2.2-28**). Hydrological patterns that produce a maximum number of patches with high prey availability (i.e., high water levels at the end of the wet season and low water levels at the end of the dry season) are necessary for high reproductive outputs (Gawlik 2002, Gawlik et al. 2004). Depending upon the elevation and microtopography throughout WCA 3 and ENP, implementation of the TSP would produce the same variety of wetland habitats as the FWO that would support prey densities conducive to successful wading bird foraging and nesting, providing a minor to moderate beneficial effect.

5.2.4.6 Eastern Indigo Snake

Since Eastern indigo snakes occur primarily in upland areas, their presence within the Greater Everglades portion of the project area is somewhat limited; however, they have a high probability of occurrence within the project construction footprint. Habitat known to support Eastern indigo snake would be lost within the construction area. Standard protection measures for the Eastern Indigo snake will be implemented during construction in order to minimize impacts.

5.2.4.7 Florida Manatee

As compared to the FWO, the TSP would decrease damaging high-volume flows to the Northern Estuaries, providing minor beneficial effects to manatees and their critical habitat. Decreased flows within the Northern Estuaries would reduce stress on SAV and promote increases in seagrass density and aerial extent, thereby increasing foraging opportunities for manatees in this region. Minor Increases in freshwater flows to Florida Bay could reduce salinity fluctuations and overall salinity to levels that better encompass seagrass salinity tolerance ranges. Optimal salinity ranges result in higher seagrass productivity that ultimately provides increased foraging opportunities for manatees.

5.2.4.8 Florida Panther

The TSP has the potential to have an adverse effect on Florida panther habitat. Construction of the STA on the 4,551-acre A-2 Expansion area would result in conversion of upland habitat that could be potentially adverse to the Florida panther's ability to move between natural habitat. For all alternatives, conversion of upland habitat that could be potentially used by the Florida panther to transverse the area to wetland habitat, thereby eliminating potential habitat for the Florida panther would result in an adverse effect.

5.2.4.9 Smalltooth Sawfish

The smalltooth sawfish resides in the Caloosahatchee River and adjacent Charlotte Harbor estuaries, and has the potential to be found in the southern estuaries where juveniles could potentially occur and feed along red mangrove shorelines. The TSP has the potential to provide a minor beneficial effect to the smalltooth sawfish and their critical habitat by reducing excessive freshwater flows and improving the salinity regime throughout the Caloosahatchee Estuary; and by increasing freshwater flows into the coastal wetlands adjoining Florida Bay, subsequently reducing the duration and occurrence of hypersaline conditions.

5.2.4.10 Sea Turtles (Green, Hawksbill, Leatherback, Kemp's Ridley, and Loggerhead)

Sea turtles live in tropical and subtropical waters and are found foraging in nearshore seagrass habitats within the northern estuaries, southwestern estuaries, and Florida Bay. Decreased high-level freshwater flows to the northern estuaries in the TSP would reduce stress on SAV and promote increases in seagrass density and aerial extent. Increased freshwater flows to Florida Bay estuaries would reduce salinity fluctuations and produce overall salinity beneficial to seagrass. Optimal salinity ranges result in higher seagrass productivity, ultimately providing increased foraging opportunities for sea turtles. The TSP has the potential to provide a minor beneficial effect to sea turtles as a result of the improved salinity regime within the Northern Estuaries and Florida Bay. A detailed description of the individual species is provided in **Appendix C.2.2.4.10 -2.2.4.14** and **Annex A.**

5.2.5 State Listed Species

The CEPP PACR project area contains habitat suitable for the presence, nesting, and/or foraging of 24 State-listed threatened, endangered, and species of special concern fauna and flora. State-listed species include the following:

Vertabrate fauna – Big Cypress fox squirrel (*Sciurus niger avicennia*), Everglades mink (*Mustela vison evergladensis*), Florida sandhill crane (*Grus canadensis pratensis*), snowy plover (*Charadrius alexandrius*), southeastern American kestrel (*Falco sparveriuspaulus*), least tern (*Sterna antillarum*), white-crowned pigeon (*Columba leucocephalus*), burrowing owl (*Athene cunicularia*), little blue heron (*Egretta caerulea*), tricolored heron (*Egretta tricolor*), reddish egret (*Egretta rufescens*), American oystercatcher (*Haematopus palliates*), black skimmer (*Rynchops niger*), roseate spoonbill (*Platalea ajaja*), gopher tortoise (*Gopherus polyphemus*), and rim rock crowned snake (*Tantilla oolitica*). Species of special concern include the Sherman's fox squirrel (*Sciurus niger shermani*) osprey (*Pandion haliaetus*) [the osprey is a State-listed species only for the Monroe county population].

Flora – pine-pink orchid (*Bletia purpurea*), which frequents the edges of the farm roads just above wetland elevation; the lattice-vein fern (*Thelypteris reticulate*) which is found occasionally in the forested wetlands; Eaton's spikemoss (*Selaginella eatonii*) and Wright's flowering fern (*Anemia wrightii*), both found in the Frog Pond natural area; along with the Mexican vanilla plant (*Vanilla mexicana*) and Schizaea tropical fern (*Schizaea pennula*) located on tree islands in the upper Southern Glades region.

While small foraging or nesting areas utilized by many of these animal species may be affected by this project, the TSP should not have any negative effects on protected State species when compared to the FWO. Impacts to wading bird species as a group will be similar to those specified in **Section 5.2.4.5** affecting the wood stork. Subtle changes in water quality can also support the prey base so that net effects on forage availability can be variable. Overall, no long-term, adverse impacts are anticipated to State-listed species as a result of this project. For a more detailed analysis, please refer to **Appendix C.2.2**.

5.2.6 Wildlife

A comparison of the FWO and TSP and their potential effects on wildlife within the affected area is summarized below and detailed in **Appendix C.2.2.5**. Effects on State and Federally listed species are described in further detail in **Appendix C.2.2.4** and **Annex A**. Further details on the effects of the alternatives can be found in the Fish and Wildlife Coordination Act Report in **Annex A.** Changes in water quality also have the potential to affect prey forage base through altering of vegetation composition or structure. Water quality will continue to be monitored; potential effects are largely uncertain at this time.

5.2.6.1 Invertebrates

Short-term, negligible effects to the invertebrate community within Lake Okeechobee are anticipated for the TSP. As compared with the FWO, the TSP shows a minor beneficial effect with performance improvement within the Northern Estuaries as indicated by less frequent and fewer high-volume flow months. Reductions in high-volume discharges and salinity fluctuations would likely benefit oysters, benthic, and epibenthic invertebrates associated with seagrass, hardbottom, and mangrove communities within the Northern Estuaries. In both the Caloosahatchee and St. Lucie Estuaries a minor adverse effect is expected due to the slight increases in low-flow violations during the dry season. Oyster monitoring data during extended dry conditions in the estuaries has shown an increase in oyster disease related to the timing, duration and severity of high salinity conditions. Supplemental flows during dry times may be warranted and have been accounted for in the IRLS water reservation process as well as the C-43 Reservoir water reservation. These dry season base flows should, whenever possible, be directed through the North Fork of the St. Lucie Estuary as was the case in pre-drainage conditions.

Within the EAA, it is anticipated that conversion of agriculture lands to an STA under the TSP would improve habitat for invertebrates.

Within the Greater Everglades, aquatic invertebrates would be sustained by even slightly longer hydroperiods with implementation of the TSP, providing a long-term, moderate beneficial effect, especially in the northern WCA 3A. Even slight increases in stages and hydroperiods within WCA 3A and ENP would promote wetland vegetation transition, increasing periphyton. Periphyton is a primary component of invertebrate diets, including apple snails. In addition to the potential for increased foraging opportunities, changes in vegetation resulting in expansion of wet prairie and increases in emergent vegetation would also provide habitat structure critical for apple snail aerial respiration and egg deposition (Turner 1996, Darby et al. 1999).

Crayfish are important components within the Everglades food web, serving as primary dietary components of higher trophic level species including fish, amphibians, alligators, wading birds, and mammals such as raccoons and river otters (Kushlan and Kushlan 1979). Even the slight increases in hydroperiods associated with the PACR alternatives would likely increase crayfish density within northern WCA 3A and ENP, particularly within the marl prairies. It also should be noted that increases in hydroperiod may have the opposite effect in some areas without long enough dry periods to reduce large predatory fish populations, which can reduce crayfish populations. There is a balance of dry periods (that reduce large predatory fish) and wet periods that help maintain crayfish populations; however, overall it is expected that there would likely be a net increase in crayfish. The TSP would increase hydroperiods within this region resulting in increased native crayfish productivity having a long-term, minor beneficial effect.

The TSP would have long-term minor beneficial effect on invertebrate populations associated with near-shore Florida Bay with a small increase in freshwater input resulting in minor decreased salinities.

5.2.6.2 Fish

Implementation of the TSP is expected to have a negligible effect in Lake Okeechobee and a minor beneficial effect on fish in the Northern Estuaries by reducing the number of high-flow discharge events, and improvements in fisheries habitat such as seagrass and oyster beds are expected to occur. Negligible effects on fish species throughout much of Florida Bay, ENP, and the Greater Everglades would be expected, except for the northern WCA 3A, where moderate, long-term benefits are expected.

Within the EAA, it is anticipated that conversion of agriculture lands to freshwater wetlands within the STA under the TSP would improve fish habitat.

Introduction or expansion of non-native fish species due to changes in water distribution are likely to occur; however, the extent of invasion is uncertain at this time providing a minor adverse effect. A detailed analysis is provided in **Appendix C.2.2.5.2**.

5.2.6.3 Amphibians and Reptiles

While the project will be beneficial for aquatic and semi-aquatic species of herpetofauna such as the threatened American crocodile, some species such as the threatened eastern indigo snake may lose habitat. The increased in hydroperiod may allow for the expansion of non-native herpetofauna such as large non-native snakes. Overall, long-term, minor beneficial effects to the amphibian and reptile communities are anticipated with the TSP. Within the EAA, it is anticipated that conversion of agriculture lands to freshwater wetlands within the STA would improve habitat for amphibians and reptiles. Rehydration within previously dry areas within the northern WCA 3A would increase spatial extent of suitable habitat for aquatic amphibian species in this area. Similarly, increased hydroperiods within ENP would also benefit aquatic amphibian species. As hydrology improves within WCA 3A and ENP, it is expected that amphibian species richness would also change. Increase in forage prey availability (e.g., crayfish and other invertebrates, fish) in areas rehydrated by TSP implementation would also directly benefit amphibian and reptile species.

5.2.6.4 Birds

The freshwater and estuarine wetlands of the Everglades and South Florida Estuaries are noted for their abundance and diversity of colonial wading and shore birds. Nesting and foraging activities of resident bird species are anticipated to show a long-term, moderate beneficial effect with implementation of the TSP. Within the EAA, it is anticipated that conversion of agricultural lands to freshwater wetlands within the STA would improve habitat for bird species. Impacts on the CSSS, snail kite, wading birds, and shore bird species are further discussed in **Section 5.2.4** and **Appendix C.2.2.5.4**.

5.2.6.5 Mammals

As compared with the FWO, the TSP would provide potential long-term, minor beneficial effects to mammals anticipated with implementation of any alternative. Small mammals including raccoons and river otters, would benefit from increased crayfish and small prey fish biomass. The increase in water availability and rehydration within the northern WCA 3A and ENP under the TSP would likely benefit Everglades mink (*Mustela vison evergladensis*) as a result of increased foraging opportunities within ENP.

The implementation of the TSP may negatively affect some mammals dependent upon upland habitat. Due to increased water flow and changes in water distribution, it is anticipated that overdrained areas in the northern WCA 3A would be rehydrated, triggering a vegetation transition from upland to wetland habitat. Although mammals occurring within the area are adapted to the naturally fluctuating water levels in the Everglades, there is an increased potential for this vegetation transition to have a short-term moderate, adverse, and unavoidable effect on some mammals using upland habitat for refugia and food source. For additional information on high water closures for mammals in WCA 3A, see **Appendix C.2.2.15.** High water is a concern for deer populations within northern WCA 3A that utilize tree islands. Deer and other upland wildlife species (bobcats, raccoons, marsh rabbits) are mobile and will move in response to high water conditions from tree islands to higher ground, including levees. Habitat quality in these areas are generally less desirable, predation is greater which results in increased mortality. No significant negative effects on mammals in the remainder of the project study area are anticipated.

5.2.7 Essential Fish Habitat

The TSP has the potential to reduce the frequency and volume of high-level flows from Lake Okeechobee to the Caloosahatchee River Estuary and the St. Lucie Estuary, thus reducing the potential for adverse impacts on estuarine and nearshore biota associated with EFH, providing a minor beneficial effect. These changes may affect EFH, although effects on the aquatic resources are anticipated to be minor and beneficial. A more detailed analysis of the EFH can be found in **Appendix C.2.2.7** and **Appendix C.4.13**.

5.2.8 Hydrology

A summary of the anticipated long-term hydrologic effects of the TSP, which were previously described in **Section 4.6.2**, is presented in **Table 5.2-1**. A comprehensive discussion of the anticipated long-term hydrologic effects of the TSP is provided in **Section C.2.2.8** of **Appendix C.2.2**. The determination of the directionality of the long-term hydrologic change (improvements and/or adverse hydrologic change) within each specified geographic region is principally based on the results of the ecological evaluations, where available, which are described in **Section 4.6.2**. All the alternatives are separately compared to the FWO in **Section 5.1.8**.

Table 5.2-1. Effects of the TSP on Hydrology

Geographic Region	FWO	TSP
Lake Okeechobee	Moderate hydrologic change, with improvements from reducing the frequency of low lake stages and adverse effect from increasing the frequency of high lake stages. Significant stage increase of 0.25-0.50 ft for the upper 70% of the stage duration curve, excluding extreme wet hydrologic conditions. Number of days with stages above 16 ft NGVD is increased from 768 to 1,163 during the 1965-2005 period of simulation.	Minimal hydrologic change, with improvements from reducing the frequency of lake stages near the top of the beneficial range and from further reducing frequency of extreme low stages. A minor adverse effect from slightly increasing the frequency of extreme high lake stages. A minor beneficial effect from having more lake stages within preferred stage envelope more frequently than the FWO. A minor adverse effect from decreasing the frequency of low lake stages in the lower portion of the beneficial range.

Table 5.2-1. Effects of the TSP on Hydrology (continued)

Geographic Region	FWO	TSP
Northern Estuaries	Caloosahatchee Estuary: Moderate improvement. Mean monthly flows above 2,800 cfs and 4,500 cfs are reduced by 11 months and 4 months, respectively (14% and 12% reductions, respectively. Mean monthly flows less than 450 cfs are reduced by 4 months (15%). St. Lucie Estuary: Moderate to significant improvement. Mean monthly flows above 2,000 cfs and 3,000 cfs are reduced by 29 months and 7 months, respectively (34% and 23% reductions, respectively). Mean monthly flows less than 350 cfs are reduced by 27 months (29%). Additional analysis for Savings Clause requirements is provided in Annex B.	Caloosahatchee Estuary: Moderate improvement. Mean monthly flows above 2,800 cfs and 4,500 cfs are reduced by 9 and 5 months, respectively (13% and 17%) as compared to the FWO). Mean monthly flows less than 450 cfs increase by 3 months (12%). St. Lucie Estuary: Moderate hydrologic change, with improvements for high volume discharges and adverse effect for low volume discharges. Mean monthly flows above 2,000 cfs and 3,000 cfs are reduced by 7 months and 5 months, respectively (13% and 13%).The 14-day moving average above 2,000 cfs is reduced by 14 as compared to the FWO. Mean monthly flows less than 350 cfs are increased by 1 month. Provides an overall 55% reduction in discharge volumes and a 63% reduction in the number of discharge events to the Northern Estuaries from Lake Okeechobee, in conjunction with other authorized projects. High flow discharges lasting more than 60 days in the Caloosahatchee River Estuary (CRE) or more than 42 days in the St. Lucie Estuary (SLE) have been found to be particularly damaging to the oyster populations. The additional storage and treatment proposed in the PACR would reduce the number of these discharges by an additional 40% in the CRE and 55% in the SLE, in addition to the benefits provided by CEPP. The reduction in discharges improves the salinity conditions in the estuary by reducing the frequency of events that exceed the preferred salinity envelope by 39% in the St. Lucie Estuary and by 45% in the Caloosahatchee Estuary.
Greater Everglades: WCA 2A and WCA 2B	**WCA 2A (2A-17)**: Moderate improvement. Stages are decreased by 0.1-0.3 ft under all hydrologic conditions. **WCA 2B (2B-Y)**: Minor adverse effect. Stages within WCA 2B are slightly decreased by less than 0.10 ft for wet-to-normal conditions and stages are decreased by 0.25 ft during the driest 20% of the stage duration curve. Compared to the ECB, stages within WCA 2B are moderately improved with significant increases of 0.10-0.25 ft under nearly all hydrologic conditions, excluding extreme wet conditions.	**WCA 2A (2A-17)**: Moderate improvement. Stages are slightly increased under all hydrologic conditions especially in NW 2A which tends to stay too dry. Annual overland flow increases by 60,000 ac-ft on an average annual basis. **WCA 2B (2B-Y)**: Negligible adverse impacts as stages within WCA 2B are slightly increased by less than 0.10 ft between 20%-80% of the stage duration curve.

Table 5.2-1. Effects of the TSP on Hydrology (continued)

Geographic Region	FWO	TSP
Greater Everglades: WCA 3A and WCA 3B	a) **L-28 Triangle**: Minor improvement. Stages increased by 0.1-0.2 ft during all hydrologic conditions, excluding extreme wet conditions. b) **Northwest WCA 3A (3A-NW)**: Major improvement. Stages are generally significantly increased by 0.6-0.8 ft. c) **Northeast WCA 3A (3A-NE)**: Major improvement. Stages are increased by 0.4-0.7 ft, with no significant change during extreme wet conditions and a slight increase in stage for extreme dry conditions. d) **East-Central WCA 3A (3A-3)**: Major improvement. Stages are generally increased by 0.2-0.5 ft, with no significant change during the wettest 20% of conditions. e) **Central WCA 3A (3A-4)**: Minor to Moderate favorable effect. Stages are generally increased by 0.1-0.2 ft during average to dry conditions, with a slight depth reduction during the wettest 10% of conditions and no significant change during extreme dry conditions. f) **Southern WCA 3A (3A-28)**: Minor improvement. Stages are decreased by 0.1-0.2 ft during the wettest 5% of conditions and slightly decreased during normal to dry conditions. g) **WCA 3B (Site 71)**: Moderate to major improvement. Stages are increased under all hydrologic conditions, including stage increases of 0.1 ft during the upper 20% of the stage duration curve (normal to extreme wet conditions), stage increases of 0.2-0.3 ft for normal to dry conditions, and a slight stage increase during extreme dry conditions.	a) **L-28 Triangle**: Moderate beneficial effect as stages are increased by 0.1-0.2 ft under normal-to-dry hydrologic conditions, with no significant change indicated for extreme wet conditions. b) **Northwest WCA 3A (3A-NW)**: Moderate beneficial effect as stages are increased by 0.1-0.2 ft, except in the wettest 20% of conditions. Annual overland flow increases by 47,000 ac-ft on an average annual basis. c) **Northeast WCA 3A (3A-NE)**: Minor beneficial effect. Stages increased by 0.1 ft with a minor decrease during 30% dry conditions. Annual overland flow increases by 47,000 ac-ft on an average annual basis. d) **East-Central WCA 3A (3A-3)**: Minor beneficial effect. Stages slightly increased by less than a 0.1 ft, with no significant change during the wettest 5% of conditions. e) **Central WCA 3A (3A-4)**: Negligible effect. Stages experience a minor increase of less than a 0.1 ft during average conditions with no significant change during extreme dry and wet conditions. f) **Southern WCA 3A (3A-28)**: Minor beneficial effect. Stages are decreased by 0.1-0.2 ft during the wettest 5% of conditions and slightly decreased during normal-to-dry conditions. g) **WCA 3B (Site 71)**: Negligible effect. Peak stages exceed 9.0 ft NGVD less than 1% of period of simulation.

Table 5.2-1. Effects of the TSP Hydrology (continued)

Geographic Region	FWO	TSP
Greater Everglades: ENP	a) **Northwest ENP (NP-201)**: Minor to moderate adverse effect. Stages are significantly decreased by 0.1-0.3 ft under both wet and dry hydrologic conditions; stages are slightly increased or unchanged for normal hydrologic conditions between approximately 35% and 55% on the stage duration curve. b) **Northeast ENP (NESRS-2)**: Major improvement. Stages are significantly increased by 0.5-0.9 ft under all hydrologic conditions. c) **Central ENP (P-33)**: Major improvement. Stages are increased by 0.2-0.4 ft under all hydrologic conditions. d) **Taylor Slough**: Minor adverse effect. Stages are slightly decreased by approximately 0.1 ft during the wettest 20% of hydrologic conditions and slightly increased by 0.1-0.2 ft during normal to dry hydrologic conditions.	a) **Northwest ENP (NP-201)**: Stages are increased by 0.1 ft during 30% wettest hydrologic conditions b) **Northeast ENP (NESRS-2)**: Minor improvement. Stages are not significantly (less than 0.1 ft) increased under all hydrologic conditions. c) **Central ENP (NP-33)**: Minor improvement. Stages are slightly increased under 40% wettest hydrologic condition. d) **Taylor Slough**: Stages are slightly increased by less than a 0.1 ft during the driest 50% of hydrologic conditions.
Southern Estuaries	a) **Biscayne Bay**: Minor-to-moderate adverse effect. Combined total average annual canal discharges to central and southern Biscayne Bay are increased by 17,000 ac-ft (15%). Average annual canal discharges to northern Biscayne Bay are reduced by 46,000 ac-ft (11%). b) **Florida Bay**: Moderate improvement. Combined average annual overland flows from southern ENP to Florida Bay (Transect 23) are increased by 23,000 ac-ft (9%).	a) **Biscayne Bay**: Minor beneficial effects to nearshore Biscayne Bay. Combined total average annual canal discharges to central and southern Biscayne Bay are increased by 6,200 ac-ft (2%). Average annual canal discharges to northern Biscayne Bay are increased by 12,000 ac-ft (2%). b) **Florida Bay**: Minor beneficial effects. Combined average annual overland flows from southern ENP to nearshore Florida Bay (Transect 23) are increased by 7,000 ac-ft.

5.2.9 Water Quality

The assessment of project impacts to water quality are summarized in **Table 5.2-2**. The detailed analyses are found in **Appendix C.2.1**, **Appendix C.2.2,** and **Annex F**.

Table 5.2-2. Effects of the TSP on Water Quality

Geographic Regions	FWO	TSP
Lake Okeechobee	Slight changes to operations not expected to result in significant WQ impacts; however, additional backflow into the lake at S-308 increases the annual phosphorus load slightly. Changes in phosphorus loads will be addressed holistically throughout the watershed via the Florida Department of Environmental Protection's Lake Okeechobee Basin Management Action Plan (BMAP) process (Section 403.067, Florida Statutes). The BMAP is currently under development via a public stakeholder driven process.	Relative to the FWO, no effect to lake water quality is expected.
Northern Estuaries	Number of low and high salinity events for Caloosahatchee and St. Lucie is reduced. Improved nutrient and dissolved oxygen conditions expected to result from reduced high flow events from Lake Okeechobee, improved Lake Okeechobee nutrient levels, and improved estuary basin runoff quality.	A moderate beneficial effect relative to FWO, the number of high-flow events for the Caloosahatchee and St. Lucie Estuaries is reduced in the TSP. The number of low-flow events would increase slightly in both estuaries but could potentially be managed with improved operations of local basin reservoirs such as C-43 and the C-23/24 reservoirs. Improved salinity, color, turbidity, nutrient, and dissolved oxygen conditions are expected to result from reduced high-flow events from Lake Okeechobee. A reduction in high flow events would significantly benefit water quality.
EAA	Use of A-2 FEB lands in project will slightly reduce total basin nutrient loads. Otherwise similar to FWO. CEPP plan increases flows through the Central Flow path, but it also provides increased FEB storage. Based on DMSTA modeling, the additional FEB storage provided in the central flow path by CEPP, in combination with the A-1 FEB, STA-2, and STA-3/4, is sufficient to handle the additional CEPP flows (approximately 210 kac ft/yr) and still achieve the WQBEL. However, there are still uncertainties associated with treatment of CEPP flows using the existing conveyance features, STA facilities, and portion of A-1 FEB capacity. The CEPP adaptive management plan will address some of the uncertainties associated with operating the integrated A-1/A-2 FEB integrated system. It is expected that the A-2 FEB will accrete peat soils and capture carbon from the atmosphere.	DMSTA water quality modeling was performed, and STAs sized to ensure TSP compliance with the WQBEL.

Table 5.2-2. Effects of the TSP on Water Quality (continued)

Geographic Regions	FWO	TSP
Greater Everglades	**WCA 2**: Negligible effects. **WCA 3A**: Backfilling of northern portion of Miami Canal and re-direction of water into the northern marsh areas will result in greater uptake of nutrients and sulfate in northern WCA 3A. Increased flows and new flow patterns may result in increased water column phosphorus concentrations at one or more TP rule stations in the short term. The effect on TP rule compliance is uncertain; though the impact is likely to be minimal in the long term. Reduced incidence of dry out of the northern marsh should limit peat oxidation and nutrient re-mobilization. Reduced dryout in the southern marsh and maintenance of water levels in canals, especially L-67A, will also limit oxidation and resuspension. Lower phosphorus and sulfate concentrations should occur in southern WCA 3A. Redistribution of flows into the northern marsh and away from the Miami Canal may result in a change in locations of methylmercury "hotspots" identified as areas where methylmercury concentrations in fish are high. It is expected that the sawgrass prairie communities north of Alligator Alley will have a higher probability of succession which suggests positive peat soil accretion and carbon capture from the atmosphere. **WCA 3B**: Reduction in dry out events relative to FWO will result in reduced peat oxidation / remobilization of nutrients. Additional flows into WCA 3B through the S-631 structure may result in increased water column phosphorus concentrations at one or more TP rule stations in the short term; however, this should have minimal impact on TP rule compliance long term. **ENP**: It is uncertain how changes in flow distributions proposed under CEPP will impact compliance with Appendix A of the 1991 Settlement Agreement. Over the long-term, distributing the flow over the northern WCA 3A marsh, reducing short-circuiting down the canals to ENP, adding more flow from the lake that is treated to the WQBEL, and distributing these flows over the marsh should result in	Negligible beneficial effects. Conditions in the WCA 2, WCA 3A, WCA 3B, and ENP would be expected to be similar to the FWO. **WCA 3A**: The effect on TP rule compliance is uncertain; though the impact is likely to be minimal in the long term. Reduced incidence of dry out of the northern marsh should limit peat oxidation and nutrient re-mobilization. Reduced dryout in the southern marsh and maintenance of water levels in canals, especially L-67A, will also limit oxidation and resuspension. Lower phosphorus and sulfate concentrations should occur in southern WCA 3A. **ENP**: It is uncertain how changes in flow distributions proposed under CEPP will impact compliance with Appendix A of the 1991 Settlement Agreement. Over the long-term, distributing the flow over the northern WCA 3A marsh, reducing short-circuiting down the canals to ENP, adding more flow from the lake that is treated to the WQBEL, and distributing these flows over the marsh should result in improvements by lowering the flow weighted mean total phosphorus concentration entering the Park. In the short-term, to address the uncertainty in compliance with Appendix A, the Technical Oversight Committee (TOC) is reviewing applicability of the current Appendix A compliance methodology for a restored ecosystem. Relative to FWO, no change to Settlement Agreement compliance for Taylor Slough is expected.

Table 5.2-2. Effects of the TSP on Water Quality (continued)

Geographic Regions	FWO	TSP
	improvements by lowering the flow weighted mean total phosphorus concentration entering the Park. In the short-term, to address the uncertainty in compliance with Appendix A, the Technical Oversight Committee (TOC) is reviewing applicability of the current Appendix A compliance methodology for a restored ecosystem. Relative to FWO, no change to Settlement Agreement compliance for Taylor Slough is expected.	
Southern Estuaries	Improved salinity conditions relative to FWO condition. With-project mean salinity moves closer to the target with a 2 psu decrease in the bay's central zone and an average salinity decrease of 1.5 psu among all bay zones for wet and dry seasons. While this appears to be a small change, this grand mean of salinity improvement (over a simulated 36-year period) is still a major step toward the restoration target.	Minor beneficial effects to salinity. Improved salinity conditions relative to FWO, with project salinity moves closer to the target with a 0.5 psu decrease in Florida Bay.

5.2.10 Air Quality

Comparison between the FWO and the TSP results in minor beneficial effects with a decrease in dry events and subsequent fire incidence should improve air quality. Creation and rehydration of wetlands is expected to result in increased CO_2 sequestration through peat accretion.

Negligible effects would be expected from emissions. All environmental air permits will be acquired to ensure all air quality standards are met for proposed pump stations.

5.2.11 Hazardous, Toxic, and Radioactive Waste

As compared to the FWO, the TSP would utilize the A-2 Expansion area lands. These lands would be converted to an STA with the necessary associated project components. Potential for new HTRW or pesticide applications to soils is reduced relative to the FWO condition for the TSP (**Table 5.2-3**). The expanded HTRW assessment is found in **Appendix C.2**. HTRW reports and correspondence are found in **Annex H**. Any required corrective actions will be completed by the Non-Federal Sponsor at the Non-Federal Sponsor's cost consistent with the residual agricultural chemical policy assessment found in **Appendix C.2.2**.

Table 5.2-3. Effects of the TSP on HTRW

Geographic Regions	FWO	TSP
Lake Okeechobee	Increased development within basin may result in new HTRW sites while existing ones should continue to be remediated.	Same as FWO.
Northern Estuaries	Increased development within Caloosahatchee and St. Lucie basins may result in new HTRW sites being identified while response actions are expected to continue at existing sites.	Same as FWO.
EAA	A-2 Expansion area lands will continue to be farmed which may result in new HTRW releases on these lands as well as additional pesticide application to cultivated areas.	A-2 Expansion area lands would be converted to aquatic habitat reducing the possibility of future HTRW release on these lands having long-term beneficial effects.
Greater Everglades	Response actions are completed on FDEP identified HTRW sites and new sites are documented and eventually remediated. Potential for illegal waste disposal remains high.	Same as FWO.
Southern Estuaries	Response actions are completed on FDEP identified HTRW sites and new sites are documented and eventually remediated.	Same as FWO.

5.2.12 Noise

The TSP would result in minor and short-term increases in noise during construction as compared with the FWO and a less than significant effect. All of the alternatives include construction of an additional pump station, which would result in long-term, negligible increases in noise, which is expected to be less in comparison to current ongoing noise associated with agricultural equipment use in the agricultural fields.

5.2.13 Aesthetics

Short- and long-term minor adverse effects to aesthetics would be expected from the storage and treatment components and the conveyance improvements.

Lake Okeechobee operations, under the TSP, would have long-term minor beneficial effects to aesthetics in the overall study area by improving ecological conditions.

The EAA Storage Reservoir would reduce high volume discharges into the Northern Estuaries resulting in lower suspended solids, increased water clarity, and better maintenance of healthy SAV beds. These beneficial effects would somewhat offset any minor adverse effects from the storage and treatment components and the conveyance improvements.

Short-term effects would be due to the use of heavy equipment during the construction of the reservoir and supporting infrastructure, and along the canals undergoing improvements. Long-term effects would be due to the establishment of a permanent man-made reservoir and STA supporting infrastructure.

The additional increase in water flow to the south would improve the ecological structure, which in turn would improve aesthetic values in southern Florida when compared to the FWO. Although natural areas in southern Florida would continue to be comprised of wetlands, sawgrass marshes, wet prairies, and tree islands, there would be an improved aesthetic value due to re-establishment of hydropatterns and sheetflow throughout the region.

5.2.14 Land Use

The only changes resulting in significant long-term land use change are the lands being converted from agricultural use to project features. The A-2 Expansion area includes 4,155 acres currently used for agriculture that would be converted to an STA or a storage reservoir. Of the 4,155 acres in the A-2 Expansion area, 500 acres are currently privately owned with the remainder under public ownership.

5.2.14.1 Wetlands

For the TSP, almost all the future development within the study area is expected to occur on lands that are currently or formerly used for agriculture. The TSP would shift 4,155 acres from agricultural land use with wetland soils to higher quality wetlands with the conversion of the A-2 Expansion area from sugar cane to an STA. The TSP adds higher quality wetland habitat and improved functionality adjacent to the Greater Everglades.

5.2.14.2 Agriculture

The project features would be placed on 4,155 acres that are currently used to cultivate sugarcane. The TSP would minimize the impacts to agricultural lands while maximizing ecological benefits in a cost-effective manner. In addition, an evaluation has been conducted on the South Dade conveyance system to ensure that existing levels of flood control will be maintained to support agricultural operations in Miami-Dade County. Apart from the conversion of 4,155 acres within the A-2 Expansion, the TSP is expected to have negligible effect on agriculture relative to FWO conditions.

Coordination with the USDA and NRCS to meet the requirements of the Farmland Protection Policy Act, will occur. When detailed design information that locates each of the plan components is completed, it can then be determined how many acres of unique farmland would be affected by the Project. (Refer to **Appendix C.4.10**).

5.2.15 Socioeconomics

5.2.15.1 Population

Except for the anticipated socioeconomic benefits associated with improved environmental conditions in the Northern Estuaries (**Section 6.2.3**), there are negligible impacts to human populations between the FWO and TSP.

5.2.15.2 Water Supply and Flood Control

A summary of the anticipated long-term effects on water supply and flood control of the FWO and TSP is presented in **Table 5.2-4**. Based on the period of simulation analysis for the TSP, the project modifications maintain the pre-project levels of service for flood control and water supply consistent with the requirements of the WRDA 2000 and Section 373.1501 F.S.

Table 5.2-4. Effects of the TSP on Water Supply and Flood Control

Geographic Region	FWO	TSP
Lake Okeechobee	Minor-to-moderate improvement. Mean annual EAA water supply demands not met are decreased from 8% to 6%. LOSA water supply cutback percentage is increased for 1 of the 8 years with the largest water supply cutbacks.	Negligible improvement. Compared to the FWO, mean annual EAA water supply demands not met are decreased from 6% to 5% and for other LOSA basin demands not met decreased from 4% to 3%. LOSA water supply cutback severity, magnitude, and duration is improved when compared to the FWO for all of the 8 worst years in the POR.
Greater Everglades	Moderate flood control improvement. The frequency of WCA 3A stages within Zone A of the Regulation Schedule is moderately increased from 18% to 22% of the 1965-2005 period of simulation. Stages within the wettest 10% of hydrologic conditions, however, are generally reduced by 0.2-0.3 ft.	Negligible flood control improvement. Compared to the FWO, the frequency of WCA 3A stages within Zone A of the Regulation Schedule is moderately increased from 18% to 26% of the 1965-2005 period of simulation. Stages within the wettest 10% of hydrologic conditions, however, are generally the same or increased up to 0.2- ft.
Lower East Coast Service Area 2 (Broward)	Negligible. No change in the number of water years with 3 or more consecutive months with restrictions. No significant changes to local groundwater stages, which are prevalent through normal-to-dry hydrologic conditions. An additional 12 million gallons per day (MGD) is provided for LECSA 2 to meet demand.	No change from FWO.
Lower East Coast Service Area 3 (Miami-Dade)	Moderate improvement for water supply and flood control, with no anticipated adverse effects. a) Decrease of 3 water years with 3 or more consecutive months with restrictions. b) L-30 Canal stages are increased by 0.1-0.6 ft for normal-to-extreme dry conditions; moderate reduction of 0.1-0.2 ft for flood control stages within the wettest 10% of the hydrologic conditions, with no significant change observed for the upper 1% of the stage duration curve. c) L-31N Canal stages are increased by -.0-0.2 ft during dry conditions; significant reduction to flood control stages within the wettest 5% of hydrologic conditions. Reduced stages are indicated during the driest 5% of hydrologic conditions for areas east of L-31N and south of the 8.5 SMA.	No change from FWO.

Table 5.2-4. Effects of the TSP on Water Supply and Flood Control (continued)

Geographic Region	FWO	TSP
	d) No significant changes to C-111 Canal stages between S-176 and S-18C during normal-to-dry hydrologic conditions, with a 0.1-0.2-ft increase during normal hydrologic conditions; no significant change to flood control stages within the upper 10% of the stage duration curve. e) Minor increase to stages in the wettest 10% of the hydrologic conditions for areas immediately east of Pennsuco wetlands (Miami-Dade County), with stage increases of less than 0.20 ft. f) An additional 5 MGD is provided for LECSA 3 to meet demand.	

5.2.15.3 Recreation

Effects of the TSP on recreation are presented in **Table 5.2-5** with additional details provided in **Appendix C.2.2.15**. **Table 5.2-6** provides information on when the FWC considers closures in the EWMA due to high or low water stages. A closure event for these tables is one or more consecutive days when high or low water criteria are met based on the two-gage average for WCA 3A-2 and WCA 3A-3.

Table 5.2-5. Effects of the TSP on Recreation

Geographic Regions	FWO	TSP
Lake Okeechobee	No Effect. There is no impact to recreational navigation.	Minor improvements for TSP based on improved recreational navigation opportunities.
Northern Estuaries	Reduction in extremely high flows to the estuaries that currently damage fisheries would provide minor beneficial effects by enhancing utilization of the estuaries by fish and subsequently improve related to recreation opportunities such as fishing, boating and kayaking.	Minor additional beneficial effects on recreation from further reductions in high flows to the estuaries resulting from the CEPP PACR. Improving estuarine conditions will increase and enhance utilization of estuaries by fish and subsequently improve related recreational opportunities such as fishing, boating and kayaking.
EAA	The FEB feature will add approximately 14,000 acres of recreational opportunities and recreation features similar to those in the Greater Everglades, providing a minor and less than significant beneficial effect.	Moderate beneficial recreation effects due to the STA and reservoir features would provide increased recreational opportunities including but not limited to fishing, sightseeing, hunting, hiking, biking, and bird watching.

Table 5.2-5. Effects of the TSP on Recreation (continued)

Geographic Regions	FWO	TSP
Greater Everglades	Improved hydrology will enhance wildlife populations through improved survival and reproduction, subsequently resulting in a minor and less than significant beneficial effect for outdoor recreation opportunities. Proposed facilities will enhance the public's ability to access into and within the Greater Everglades. Increased hydration in the very northern WCA 3A areas that have been drier could have a short-term significant, adverse and unavoidable effect on hunting (deer, hog, and rabbit). Conversely, a long term major significant benefit occurs due to increased fire protection for the peat soils, thus diminishing the potential for loss of this same area. Alts 4R and 4R2 incorporate the least negative effect on Northern WCA 3A mammal hunting opportunities. In these northern dry areas, public access is often limited to track vehicles; rehydration will increase public access through improved conditions favorable to airboats. Access for recreational fishing by power boat will have a major and adverse significant effect through backfilling the Miami Canal. This affects 14 of the 33 miles of the Miami Canal in the WCA 3. Fishing opportunities throughout the Greater Everglades will have a major beneficial effect by the improvements in boat access and the addition of access points around proposed structures. The removal of the L-29 levee will create a marsh connection to L-29 canal and enhance fishing in this canal. Improved trail heads for access and designation of blue and greenway trails will be positive. The Blue Shanty Levee will bisect L-67C. Recreational fishing by prop boat to the northern end of L67C canal would continue to be available from a new public boat ramp located in the northern end of L67C at the S151, providing a minor	Improved hydrology would enhance wildlife populations through improved survival and reproduction, subsequently resulting in a minor and less than significant beneficial effect for outdoor recreation opportunities. A long term significant beneficial effect is the substantial decrease in days of low water closures. This protects the habitat, recreation relies on, as it decreases the loss from oxidation and risk of fire to peat soils. In these northern drier areas, public access is often accomplished with track vehicles; the improved stages, indicated by less fire closures, would allow improved public access using airboats instead of track vehicles.

Table 5.2-5. Effects of the TSP on Recreation (continued)

Geographic Regions	FWO	TSP
	and less than significant beneficial effect. Also at the S151 a new public boat ramp will allow access into the northern 5 miles of the Miami Canal south of S151 not previously served by a public boat ramp. The Blue Shanty levee will have an airboat crossing, at full height, so as to not bisect the airboat use within WCA 3B. A boat ramp will be added near S-333 to provide access to the L-29 canal so the L-29 divide structure does not prevent boat access. The L-29 divide structure will also serve as a pedestrian and vehicle access to the remaining L-29. The Blue Shanty Levee will serve as reroute connection for greenways trail users when the L-29 levee is removed to ensure contiguous connection east to west between S333 and S334.	
EWMA	High and low water closures already exist. High water closures diminish access to camps and close portions or all of a hunting season. Low water closures also restrict access to camps and while these do not occur during the hunting season this condition leaves peat soils at a higher risk of fire, effecting future recreation negatively if a fire causes a loss of habitat.	Increases in the number of days and events of high water during the TSP create a negligible increase in closures during the hunting seasons. These increased closures occur in years where a closure during that hunting season would also be expected during the FWO, except for one occasion for two weeks in the period of record. A long term significant beneficial effect is the substantial decrease in days of low water closures. This protects the habitat, recreation relies on, as it decreases the loss from oxidation and risk of fire to peat soils. In these northern drier areas, public access is often accomplished with track vehicles; the improved stages, indicated by less fire closures, would allow improved public access using airboats instead of track vehicles.
Southern Estuaries	Access to the Southern Estuaries would not change based on CEPP, however, increase in flows to Florida Bay would enhance fish populations and subsequently improve related recreational opportunities such as fishing, boating and kayaking, providing a minor beneficial effect.	Negligible effects on recreation would occur in the Southern Estuaries

Table 5.2-6. Closures Over the Period of Record in the EWMA for the FWO and TSP

Alternative	High Stage Closures over 41-yr POR (2 Gage avg.* > 11.6')			Fire Closures over 41-yr POR (2 Gage avg.** <= 9.16')			Total High Water and Low Water Closures			
	Closure Days	Closure Events	Avg. Closure Duration (Days)	Closure Days	Closure Events	Avg. Closure Duration (Days)	Closure Days	Closure Events	Avg. Closure Duration (Days)	% of POR-Closure
EARFWO	614	18	34.1	203	9	22.6	817	27	30.3	5.5%
C240A	779	22	35.4	115	7	16.4	894	29	30.8	6.0%

Notes:
* 2 Gage average is based on cells WCA 3A-2 and WCA 3A-3.
**3A-2 and 3A-3 average ground surface elevation = 9.66 ft NGVD (closure threshold is 2 gage average < 9.16.)

5.2.16 Cultural Resources

The effects of the TSP on cultural resources would be consistent with the effects for all alternatives presented in **Table 5.1-7.** A description of full preliminary analysis, background information, and descriptions of terms are presented in **Appendix C.2.2.18**.

In conjunction with the NHPA, formal consultation will be initiated with the Seminole Tribe of Florida's THPO; the Miccosukee Tribe of Indians of Florida's NAGPRA Representative; the Florida SHPO; and the Florida Bureau of Archaeological Research after the report is submitted to the ASA (CW). Formal consultation will determine if additional surveys may be needed, specifically during the PED phase, when feature designs are finalized and construction staging areas are identified.

Section 106 compliance with the NHPA will be conducted separately from NEPA and will not be completed during the current feasibility phase of the project, however would be complete prior to construction of each feature. For consideration under the NHPA, determinations of potential effects and mitigation of those effects on cultural resources listed in **Table 5.2-7** are preliminary and should not be considered final.

Pursuant to NHPA implementing regulations, 36 CFR 800.1, where possible, the project design will be modified to avoid impacting significant historic properties and culturally significant sites. Where avoidance is not possible, other mitigation measures will be considered, which could include but are not limited to data recovery excavations. The mitigation measures will be developed in consultation with SHPO, tribal groups and other interested parties as established in implementing regulations for Section 106 of the NHPA.

For this document, the use of the term cultural resources includes historic properties eligible or potentially eligible for NRHP listing and culturally significant sites. For definitions of terms, see **Section 10**.

Table 5.2-7. Effects of the TSP on Cultural Resources

Cultural Resources (Please refer to Cultural Resources in Appendix C.2.1 for further details)		
Geographic Regions	**FWO**	**TSP**
Lake Okeechobee	No effect on cultural resources.	
Northern Estuaries	No effect on cultural resource.	
EAA, including Associated Canals and Structures	Long-term adverse effect on cultural resources 8PB16039 and 8PM16040.	Consistent with the FWO, major long-term adverse effects on cultural resources sites 8PB16039 and 8PM16040. Mitigation of effects for historic property 8PB16039 potentially reduced to no effect. Mitigation of effects for culturally significant site 8PM16040 is unknown. Additional cultural resource surveys are needed on the A-2 Expansion area to determine if culturally significant sites exist.

5.2.17 Invasive Species

The TSP would have a negligible effect for establishment and spread of non-native invasive and native nuisance species, similar to the FWO. Disturbed areas resulting from construction are likely to temporarily influence the recruitment of non-native invasive and native nuisance species. The large number of existing and potential invasive plant and animal species and the often incomplete knowledge of invasive mechanisms for each species create moderate uncertainty in this evaluation. Long-term monitoring in an adaptive management framework is critical to ensure efficient management of the most threatening non-native invasive species in the affected area. Proposed management activities to address invasive species are provided in **Annex G**.

5.3 EFFECTS ON NATIVE AMERICANS

The Miccosukee Tribe of Indians of Florida and the Seminole Tribe of Florida rely upon the Everglades in its natural state to support their cultural, subsistence, and commercial activities. Portions of the Tribes' Federal Reservation lands are either partially situated or immediately adjacent to WCA 3A (**Figure C.1-11** in **Appendix C.1**). In addition, the Tribes hold easements and leases from the State of Florida over large portions of the WCA 3A. Subsistence activities for members of the Miccosukee Tribe of Indians of Florida and the Seminole Tribe of Florida include gathering of materials, hunting, trapping, frogging, and fishing; while the Miccosukee Tribes of Indians of Florida's commercial activities additionally include frogging, airboat and other guided tours, and providing recreational and tourism facilities within the Everglades.

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6.0 TENTATIVELY SELECTED PLAN

The CEPP, authorized by Section 1041(4) of the WIIN Act of 2016, will begin to reverse over 100 years of human-induced environmental degradation within the central portion of the globally significant Everglades ecosystem. Restored water depth, duration and distribution in WCA 3A, WCA 3B, and ENP will serve to recreate a landscape characteristic of a pre-drained system that will support a healthy mosaic of plant and animal life. The restored hydrology of the Everglades ecosystem will more closely resemble a naturally occurring rainfall-driven system with wet and dry cycles essential to flora and fauna propagation. Improved water depths and sheet-flowing distribution will begin to re-establish the unique ridge, slough and tree island micro-topography that once provided sustenance to the vast diversity of species inhabiting the Everglades. As authorized, the CEPP plan will redirect, on an average annual basis, approximately 210,000 ac-ft per year of additional water to the historical southerly flow path south through FEBs and existing STAs. This flow of approximately 210,000 ac-ft on an average annual basis is approximately two-thirds of the CERP goal. The STAs reduce phosphorus concentrations in the water to meet required water quality standards. Other CEPP components south of the EAA will reroute and redistribute this additional water to the historic Everglades ecosystem to achieve the restoration benefits summarized above. Additionally, the authorized CEPP plan will provide restoration benefits to the Northern Estuaries (Caloosahatchee and St. Lucie) by reducing minor and some moderate high-volume regulatory releases from Lake Okeechobee.

Despite the progress toward Everglades restoration that will result from implementation of the authorized CEPP plan, ecological conditions and functions within the Northern Estuaries and central portion of the Everglades ridge and slough community require additional infrastructure to achieve the CERP goals and objectives. Ecological conditions and functions in estuaries on the east and west coasts of Florida will continue to experience adverse impacts due to excessive damaging regulatory releases from Lake Okeechobee during wet years. The goal of the CEPP PACR is to develop a plan to provide sufficient water storage and treatment capacity south of Lake Okeechobee in the EAA to further reduce high-volume damaging discharges to the Northern Estuaries and deliver additional flow to the Greater Everglades consistent with the CERP goals.

In combination with the previously authorized projects, the CEPP PACR Tentatively Selected Plan (TSP) approaches the CERP goal of reducing damaging freshwater discharges to the Northern Estuaries by approximately 80%, by providing a 55% flow reduction in damaging discharges and a 63% reduction in the number of mean monthly high flow discharge events to the Northern Estuaries. The CEPP PACR TSP helps restore the resiliency of the Northern Estuaries by reducing the number, duration and frequency of harmful discharges from Lake Okeechobee. High flow discharges lasting more than 60 days in the Caloosahatchee River Estuary or more than 42 days in the St. Lucie Estuary have been found to be particularly damaging to the oyster populations. The additional storage and treatment proposed in the PACR would reduce the number of these discharges by an additional 40% in the Caloosahatchee River Estuary and 55% in the St. Lucie Estuary, in addition to the benefits provided by CEPP. The reduction in discharges improves the salinity conditions in the estuary by reducing the events that exceed the preferred salinity envelope by 39% in the St. Lucie Estuary and by 45% in the Caloosahatchee Estuary.

In addition to reducing damaging discharges to the Northern Estuaries, the TSP would increase CEPP water deliveries to the central portion of the Everglades from an average annual flow of approximately 210,000 ac-ft to an average annual flow of approximately 370,000 ac-ft. This will provide a significant increase in the quantity of water flowing to the central Everglades, which is essential to Everglades Restoration and achieves the CERP goal for increased freshwater deliveries to the Everglades. These additional flows are delivered with a timing shift that favor dry season flows in addition to CEPP when downstream infrastructure has adequate capacity to convey the flow (**Figure 6-6)**. As a result, the CEPP PACR reaffirms that the CEPP PPA North and South project features can accommodate the additional flows south to the central Everglades. These additional flows would result from additional canal conveyance, storage, and treatment wetlands proposed on lands within the Everglades Agricultural Area (EAA).

The TSP builds upon the CEPP and achieves the next increment of freshwater flows to the central Everglades, providing the remaining one-third of the restoration flow goal identified in CERP.

This additional flow will have the following ecological benefits to the central Everglades:

- Additional water flowing into northern Water Conservation Area 3A (WCA-3A) and Everglades National Park (ENP) will help restore vegetative communities and habitat for fish and wildlife – above and beyond the benefits provided by CEPP.
- In Northwest WCA-3A, all alternatives provide improved slough vegetation depths, reducing the time the water ponding depth in the sloughs falls below zero (less dry outs).
- In Northwest WCA-3A, all alternatives provide for longer durations where the CERP target ponding depths are achieved, which in turn improves slough vegetation suitability.
- In Northeast WCA-3A, all alternatives provide for improved slough vegetation by increasing the duration of beneficial water ponding depths.
- Overland flows under Tamiami Trail and into the northern portions of ENP are increased.
- Additional freshwater overland flow is also provided to Central Shark River Slough and Taylor Slough in all alternatives, which continues to build on the progress made by CEPP in improving the timing, distribution and continuity of sheet flow across the Everglades ridge and slough landscape. The benefits of additional overland flow to Central Shark River Slough are a continuum of the additional flows under Tamiami Trail in the natural system.

The additional water flowing into northern WCA 3A and ENP provided by the TSP would help to restore vegetative communities and habitat for fish and wildlife while providing additional improvement of natural processes critical for the development of peat soils and tree islands, which are essential features of the Everglades ridge and slough landscape. Additional overland flows would also improve salinity conditions in Florida Bay.

The TSP, Alternative C240A, includes a new 240,000 ac-ft storage reservoir, a 6,500 ac STA, and improvements to Miami Canal and North New River (NNR) Canal conveyance necessary to bring additional water from Lake Okeechobee to the storage and treatment facilities located within the EAA. These new storage and treatment features would be constructed on the A-2 parcel and A-2 Expansion area. Improvements to canal conveyance would be constructed within the existing SFWMD right-of-way on Miami and NNR Canals. The FWO project condition for the A-2 parcel included a new A-2 FEB, as authorized by CEPP, which would be replaced by a deep above-ground reservoir and STA in the TSP. The existing A-1 FEB, constructed under the State of Florida Restoration Strategies Program, will be hydraulically connected to the proposed storage reservoir for operational flexibility but no change to A-1

FEB configuration or storage depth are proposed. A detailed description of the TSP is presented in **Section 6.1** below.

6.1 PLAN DESCRIPTION

6.1.1 Plan Features

All Project Partnership Agreement (PPA) North and PPA South components of the authorized CEPP plan in areas south of the EAA are robust enough to accommodate the TSP and would remain unchanged under this CEPP PACR. The TSP affects only the water storage, treatment, and conveyance features in the New Water PPA of CEPP. The TSP features are compared to the original CEPP A-2 FEB component in **Table 6-1** and will be constructed in the EAA as described in detail below.

Table 6-1. Plan Feature Comparison of CEPP A-2 FEB and CEPP PACR

Project Feature	Unit	Quantity		% Change
		CEPP	CEPP PACR TSP	
Storage				
Storage Volume	ac ft	56,000	240,000	329%
Pump Station[1]	cfs	700	4,500	543%
Embankment Length	mi	19.9	17.6	-12%
Embankment Height	ft	11.3	37.1	228%
Impoundment depth (NFSL)	ft	4.0	22.6	465%
Treatment Area				
Treatment Area Acreage	ac	-	6,500	-
Embankment Length	mi	-	13.1	-
Embankment Height	ft	-	9.1	-
Impoundment depth (NFSL)	ft	-	4.0	-
Conveyance Improvements				
North New River Canal	cfs	-	200	-
Miami Canal	cfs	-	1,000	-
Project Lands				
A-2 Parcel	ac	14,000	14,000	-
A-2 Expansion area	ac	-	4,000	22%
Recreation Features				
Boat Ramp	-	-	1	100%

[1] CEPP A-2 FEB utilized existing pump stations G-370 and G-372 for inflow and proposes a new seepage pump station of 700 cfs (500 cfs on-line and 200 cfs standby)

The TSP includes a 240,000 ac-ft above-ground reservoir and a 6,500-acre STA, located on the A-2 parcel and A-2 Expansion area. These features will work in conjunction with the existing 60,000 ac-ft A-1 FEB, STA-2, and STA-3/4 to meet State water quality standards (**Figure 6-1**). The proposed A-2 Reservoir is 10,500 acres and designed to have a normal full storage water depth of approximately 22.6 feet. The TSP also includes 1,000 cfs of additional conveyance capacity in the Miami Canal within the EAA and 200 cfs of additional conveyance capacity in the North New River Canal within the EAA. The A-2 Reservoir outflows can be sent to the new A-2 STA (located adjacent to and directly west of the A-2 Reservoir), to the existing A-1 FEB, STA-2, and/or STA-3/4. Outflows from the A-2 STA would be conveyed to the Miami Canal south of the existing G-373 divide structure. A-2 Reservoir outflows can also be conveyed to either the Miami or North New River Canals via the intake canal.

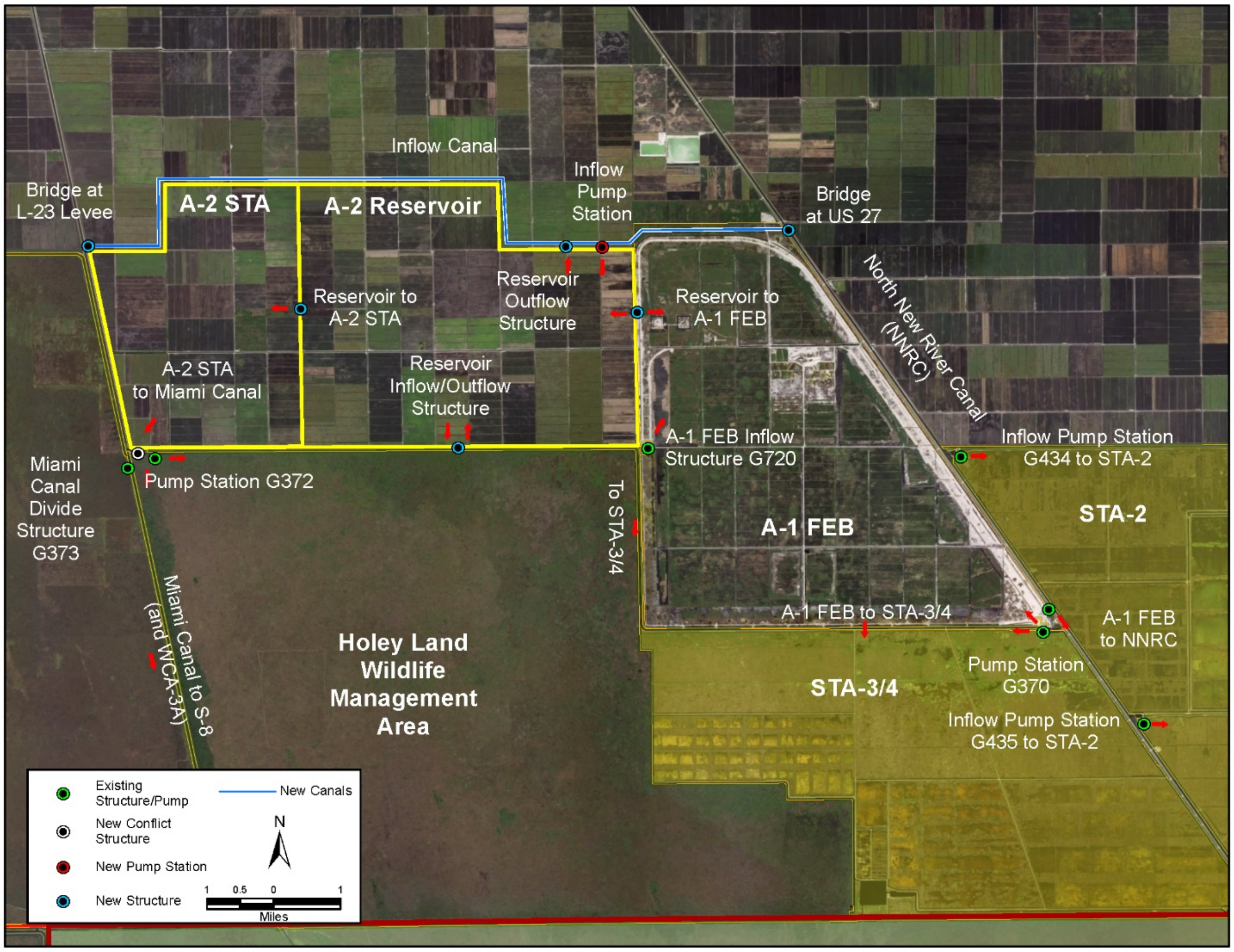

Figure 6-1. Tentatively Selected Plan (Alternative C240A)

The CEPP A-2 FEB consisted of a shallow impoundment with a single storage compartment on the A-2 parcel and did not include the A-2 expansion area in the project footprint. The CEPP A-2 FEB utilized existing pump stations (G-370 and G-372) for inflow pumping and a new 700 cfs seepage pump station. No canal improvements were identified in the CEPP PIR for the Miami and NNR canal.

The CEPP PACR features combine new and existing storage and treatment features to provide maximum operational flexibility and efficiency. Numerous planning studies and modeling activities conducted previously by the SFWMD consistently demonstrate that multi-purpose storage and treatment facilities operated in an integrated manner result in more benefits than single-purpose facilities operating in isolation. The results of this CEPP PACR modeling analysis is no different.

Proposed operations of the TSP efficiently integrate the new facilities (A-2 Reservoir and A-2 STA) with the existing State Facilities (A-1 FEB, STA-2 and STA-3/4) to meet the objectives of the project. Similar to the approach used in CEPP, the CEPP PACR TSP primarily utilizes available STA treatment capacity that exists in the dry season (November – May) at both STA-2 and STA-3/4. As expected, this results in higher average monthly inflows during dry season months as compared to current conditions (and CEPP). Under current conditions, STAs have little to no flow during the dry season which can result in stagnant conditions.

While there is more water being conveyed to the A-1 FEB, STA-2 and STA-3/4 overall as compared to CEPP, integration of the A-2 Reservoir with the new A-2 STA and State facilities provides additional flow attenuation and temporary storage capability which results in improved water depth and flow conditions in STA-2, STA-3/4 and the A-1 FEB.

The TSP includes refined operations to provide water to meet other water related needs in the EAA. These refined operations are described in detail in **Annex C**. The conditions under which such water is available are limited; therefore, no water was quantified for other water-related needs. However, as a result of additional water being stored in A-2 Reservoir, a portion of which comes directly from Lake Okeechobee, additional water may reach water users located in LOSA, which includes the EAA. See **Section 6.9.1.3** for more details.

Benefits gained from sending new water south from Lake Okeechobee in the authorized CEPP plan, and as further modified by the TSP, are derived in part from operational refinements that can take place within the existing, inherent flexibility of the 2008 LORS, and in part with refinements that are beyond the schedule's current flexibility. Modifications to the 2008 LORS will be required to optimally utilize the added storage capacity of the A-2 Reservoir to reduce damaging discharges to the Northern Estuaries and send approximately 370,000 ac-ft on an annual average basis of new water available in CEPP PACR TSP south to the Everglades, while maintaining compliance with Savings Clause requirements for water supply and flood control performance levels.

The hydrologic modeling conducted for the TSP to optimize system-wide performance incorporated the current Regulation Schedule management bands of the 2008 LORS. The hydrologic modeling of the TSP included proposed revisions to the 2008 LORS flow chart guidance of maximum allowable discharges, which are dependent on the following criteria:

- Class limits for Lake Okeechobee inflow and climate forecasts, including tributary hydrologic conditions, seasonal climate outlook, and multi-seasonal climate outlook
- Stage level, as delineated by the Regulation Schedule management bands
- Stage trends (whether water levels are receding or ascending)

Most of the 2008 LORS refinements applied in the TSP modeling lie within the bounds of the operational limits and flexibility available in the current 2008 LORS, with the exception of the adjustments made to the class limits for the Lake Okeechobee inflow and climate forecasts. Under some hydrologic conditions, the class limit adjustments made to the Lake Okeechobee inflow and climate forecasts reduced the magnitude of allowable discharges from the Lake, thereby resulting in storage of additional water in the Lake in order to optimize system-wide performance and ensure compliance with Savings Clause requirements. However, these class limit changes represent a change in the flow chart guidance that extends beyond the inherent flexibility in the current 2008 LORS. Additional information and documentation of the TSP modeling assumptions for Lake Okeechobee operations are found in the **Appendix A, Annex A-2**.

Independent of TSP implementation, there is an expectation that revisions to the 2008 LORS will be needed following the implementation of other CERP projects and Herbert Hoover Dike (HHD) infrastructure remediation. The USACE expects to operate under the 2008 LORS until there is a need for revisions due to the earlier of either of the following actions: (1) system-wide operating plan updates to accommodate CERP projects as described in **Section 6.1.3.2**, or (2) completion of sufficient HHD remediation and associated culvert improvements, as described in **Section 2.5.2**. When HHD remediation is completed and the HHD DSAC Level 1 rating is lowered, higher maximum lake stages and increased frequency and duration of high lake stages may be possible to provide the additional storage capacity assumed with the TSP. The future LORS which may be developed in response to actions (1) and/or (2) is unknown at this time. It is anticipated that the need for modifications to the 2008 LORS will be initially triggered by non-TSP actions that are expected to occur earlier than implementation of the authorized CEPP and the proposed modifications presented as the TSP. CEPP implementation in the future, with or without the modifications proposed in this CEPP PACR, may itself require even further LORS revisions to optimize system-wide performance and ensure compliance with Savings Clause requirements.

6.1.2 Lands and Interests in Lands

The following real estate interests and lands identified below are needed for construction and operations, maintenance, repair, rehabilitation, and replacement (OMRR&R) of the TSP. More details are provided in **Appendix D**.

6.1.2.1 A-2 Parcel

Fee title for the A-2 Parcel lands will be required for the TSP. Fee title for the 13,825-acre A-2 Parcel was acquired by SFWMD in the Talisman exchange/acquisition using State and Federal funds, including 9.9 acres in the vicinity of the A-2 parcel that were acquired by the SFWMD using State funds.

6.1.2.2 A-2 Expansion Area

Fee title of the lands in the A-2 Expansion area will be required for the TSP storage and treatment features. The SFWMD and the State of Florida own a combined total of 3,656 acres in the A-2 Expansion area. The remaining 500 acres are held in private ownership and will need to be acquired by the SFWMD through willing seller transactions prior to implementation of the CEPP PACR.

6.1.2.3 EAA Conveyance Improvements

EAA conveyance improvements will include deepening and widening the Miami Canal and NNR Canal. All EAA conveyance improvements will be constructed in the existing SFWMD right-of-way. No additional real estate requirements for the conveyance improvements are anticipated at this time.

6.1.2.4 Uniform Relocation Assistance Act, P.L. 91-646 as amended

Relocation benefits were addressed as part of the Talisman Exchange/acquisition agreement for the land for the proposed TSP and therefore these costs were not evaluated separately. Under P.L. 91-646, as amended, there are no additional residential relocations and no business relocations associated with the implementation of this Project.

6.1.2.5 Facility/Utility Relocations

Similar to the requirements for the CEPP A-2 FEB, Florida Power and Light power and transmission lines will have to be relocated or abandoned from the area within the proposed TSP.

6.1.3 Project Operations

The Draft Project Operating Manual (DPOM) includes operational considerations associated with the A-2 Reservoir and A-2 STA presented in this CEPP PACR TSP. The DPOM in **Annex C** includes operating criteria based on the CEPP hydrologic modeling assumptions, as modified by the proposed new features, and generally discusses the transitions to operations during the construction phase, the Operational Testing & Monitoring Period (OTMP), and the long-term Operations and Maintenance (O&M) phase. The DPOM assumes completion of all CEPP components, as modified by the TSP. Further modifications and/or revisions to the DPOM will occur during subsequent implementation phases. Development of the DPOM is an iterative process that will continue throughout the life of the project. The DPOM will be updated at periodic intervals during the detailed design, construction and operational testing and monitoring period of the project. Refinements to the operating criteria in the DPOM will be made as more project design details, data, operational experience, and general information are gained during these project phases. It is also anticipated that once the DPOM is completed and the long-term operations and maintenance phase is underway, it may be necessary to revise the DPOM from time to time based on additional scientific information and implementation of CERP or non-CERP activities.

Numerous planning studies and modeling activities conducted previously by the SFWMD consistently demonstrate that multi-purpose storage and treatment facilities operated in an integrated manner result in more benefits than single-purpose facilities operating in isolation. The results of this CEPP PACR modeling analysis is no different. Proposed operations of the TSP efficiently integrate the new facilities (A-2 Reservoir and A-2 STA) with the existing State Facilities (A-1 FEB, STA-2 and STA-3/4) to meet the objectives of the project. Similar to the approach used in CEPP, the CEPP PACR TSP primarily utilizes available STA treatment capacity that exists in the dry season (November – May) at both STA-2 and STA-3/4. As expected, this results in higher average monthly inflows during dry season months as compared to current conditions (and CEPP). Under current conditions, STAs have little to no flow during the dry season which can result in stagnant conditions.

While there is more water being conveyed to the A-1 FEB, STA-2 and STA-3/4 overall as compared to CEPP, integration of the A-2 Reservoir with the A-2 STA and State facilities provides additional flow attenuation and temporary storage capability which results in improved water depth and flow conditions in STA-2, STA-3/4 and the A-1 FEB.

The operations discussed herein represent the start-up operational strategy, recognizing that constraints in the system may be removed over time due to the completion of many of the CEPP components as well as other CERP and non-CERP Projects. The draft DPOM is presented with the recognition that multiple revisions and operational refinements will occur over the life of the project, as described below in **Figure 6-2**. The USACE and SFWMD will share in the responsibilities for conducting water management operations during the OTMP.

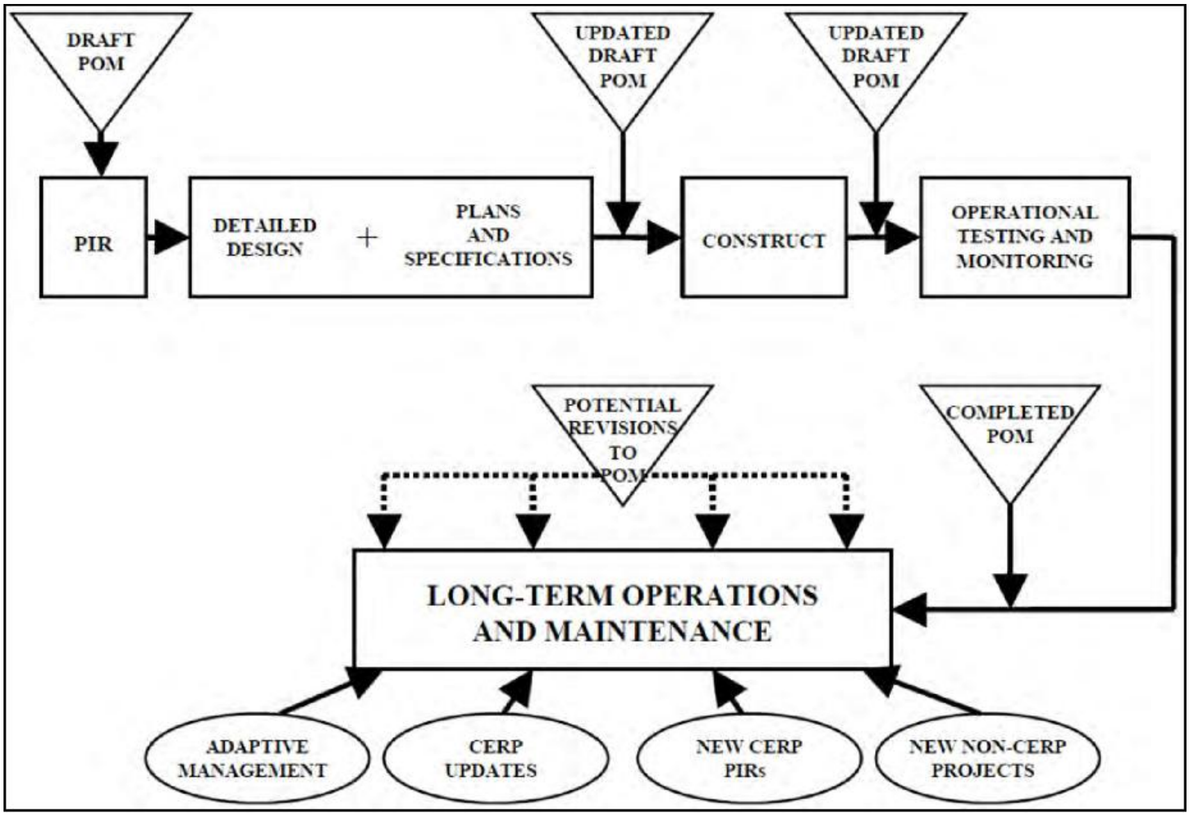

Figure 6-2. Evolution of the Project Operating Manual

6.1.3.1 Rain-Driven Operations

The TSP is consistent with CEPP regarding Rain Driven Operations (RDO). The authorized CEPP plan proposed changes to the operation of WCA 3 to better mimic a natural delivery of water through the system in response to rainfall. Unlike regulation schedule-based operations, RDO would estimate inflows and outflows in response to weekly rainfall and Potential Evapotranspiration (PET) and target water deliveries so that the weekly stage at 10 target locations (3ANW, 3A11, 3ASW, W2, 3A4, 3AS, 3ANE, 3A28, E4, 3A3) approach the corresponding weekly restoration targets. Implementing the proposed modifications from the CEPP plan would not affect RDO as presented in Section 6.1.3.1 of the CEPP PIR. Transitioning to RDO will likely be a lengthy and complex process for the USACE, but it is a necessary step to achieve the proposed restoration objectives within WCA 3A and ENP. The process for making this transition has not yet been developed, but it is envisioned for RDO to be phased in gradually when the Combined Operating Plan or CEPP components become operational.

6.1.3.2 System Operating Manual Updates

The CERP plan recognized the need to develop a System Operating Manual to ensure that the operations of all projects, both CERP and non-CERP, are integrated within the C&SF system operations to achieve the authorized purposes of the C&SF Project and the individual CERP and non-CERP projects.

The TSP is consistent with the CEPP PIR and acknowledges that a revision to the current 2008 LORS, as well as the associated Volume 3 of the Master Water Control Manual – Lake Okeechobee and EAA, will be needed to integrate the features of CEPP and the CEPP PACR as well as the HHD remediation, the

Kissimmee River Restoration, and other CERP projects which are connected or adjacent to Lake Okeechobee. Consequently, revisions to the 2008 LORS would be triggered by actions other than CEPP or the CEPP PACR implementation and the CEPP PACR will not be the mechanism to propose or conduct the required NEPA evaluation of modifications to the LORS. CEPP implementation in the future, with or without the modifications proposed in this CEPP PACR, may itself require even further LORS revisions to optimize system-wide performance and ensure compliance with Savings Clause requirements.

The completed MCRAM (Monte Carlo Reservoir Analysis Model) study on HHD indicated that upon completion of portions of the rehabilitation, high water levels up to Run25 conditions could be accommodated from a levee safety perspective. For planning purposes in this CEPP PACR, a regulation schedule which is lower or comparable to Run25 (of MCRAM model runs) is used for comparison with a goal that the alternatives do not persistently exceed elevations and durations experienced in WSE. Optimization of Lake Okeechobee operations, for the purpose of this project, consider this metric along with lake performance measures to maximize overall system benefits. This typically results in relatively short high lake water excursions when compared to the existing LORS08 and future with CEPP performance. Additional information is provided in the Model Documentation Report (**Appendix A, Annex A-2**).

6.1.4 Adaptive Management and Monitoring

The CEPP PACR Adaptive Management Plan (AM Plan) and Monitoring Plan (MP) rely heavily on the CEPP plan presented in Annex D of the CEPP PIR (2014). This 2014 plan was modified to focus on only the areas being affected by the A-2 Reservoir and A-2 STA in the CEPP PACR. The CEPP AM Plan and MP identified the monitoring information needed to inform CEPP implementation and to document restoration progress to agencies, the public, and Congress. The overall objective of both the CEPP and CEPP PACR AM Plan and MP is to focus resources on refinement of the project to fine-tune performance due to inevitable uncertainties, based on existing knowledge and knowledge that will be gained through monitoring and assessment.

CERP’s interagency science group, REstoration COordination and VERification (RECOVER), provided significant support in the development of CEPP's AM Plan and Monitoring Plan, as did Project Delivery Team (PDT) scientists, engineers, and water operators. Expertise included input from more than 10 agencies and both Tribes (Miccosukee and Seminole) of south Florida, consisting collectively of decades if not centuries of scientific and operational knowledge of the Everglades, Lake Okeechobee, the Lower East Coast, and the South Florida estuaries. Using this knowledge, key questions were identified for analysis to inform CEPP design, implementation, and potential adjustments for optimizing project performance.

The CEPP PACR AM Plan and Monitoring Plan contain descriptions of monitoring that should address specific uncertainties identified during CEPP and CEPP PACR planning, required parameters such as water quality and water levels, and ecological features that track project progress toward success. The monitoring data will be used to track progress toward the objectives of CEPP PACR, and conformance to applicable legal requirements. The monitoring descriptions are found in detail in **Annex D Part 1 Sections D.1.3 and D.1.4** and in **Annex D Parts 2, 3, and 4**. For each region of south Florida in the CEPP PACR study area, the monitoring parameters, their value to the TSP, timeframe needed to see changes, measurement frequencies, decision criteria for triggering adaptive management options, and suggested adaptive management options are provided in the AM Plan text; the information is also summarized by region in **Tables D.1.3 through D.1.9**. Monitoring durations, which are specified in **Annex D**, are dependent on the intended use of the monitoring: regulatory monitoring will be continued as long as required by applicable regulations and the adaptive management and ecological success monitoring will continue up to 10 years, per WRDA 2007 Section 2039, in coordination with the construction phases of CEPP, as modified by the TSP.

Part 1 of the AM and Monitoring Plans (**Annex D**) is the CEPP PACR AM Plan. A fundamental principle of AM is that a project can be adjusted to achieve higher performance toward the project's goals and objectives and to remain within its constraints. In AM, the adjustments are based on a scientifically efficient and sound process of learning from data. These adjustments should be viewed as intelligently fine-tuning the project, the need for which is almost inevitable in large-scale, long-term restoration projects like CERP, CEPP, and CEPP PACR. Given this fundamental principle of AM, the CEPP PACR AM Plan provides suggestions for potential improvements and refinements of aspects of the project if necessary, called Adaptive Management Options (AM Options). The suggestions are based on current experience and knowledge and are not required actions, nor are they meant to limit agencies from considering other options. The AM Options are included in the CEPP PACR cost estimates and described here per WRDA 2007 USACE implementation guidance (August 2009). The AM Options are not automatic; they are informed suggestions provided as part of the TSP that capture current knowledge of what may be needed in the future to adjust and maximize performance as CEPP PACR implementation progresses.

6.1.5 Recreation Plan Features

The proposed recreation facilities in the authorized CEPP plan will increase public access at project features in the EAA and into the Greater Everglades. Facilities in the authorized CEPP plan include sufficient gravel parking with boat ramps and trailheads, dry vault toilets, shelters, primitive camping sites and Americans with Disabilities Act compliant fishing platforms, and are described in detail in the CEPP PIR Appendix F, Recreation. The proposed modifications to CEPP as presented in this CEPP PACR would involve minor changes to planned recreation facilities in the area of the A-2 Reservoir and A-2 STA (in lieu of the currently authorized A-2 FEB). These revisions are defined in **Appendix F** of this CEPP PACR.

The proposed features of the CEPP PACR recreation plan would not require additional real estate to be purchased. All features would be compatible with the environmental purposes of the project, and would not detract from the environmental benefits and would increase the socioeconomic benefits being generated by the project. The activities that would be permitted in the project area (bicycle riding, horseback riding, nature study, wildlife viewing, walking/hiking, boating, canoeing/kayaking, sailing, fishing, and hunting) are all well-suited to the environmental purposes of the project. A major feature of the CEPP PACR TSP would be approximately 28 miles of levee top trails that will loop around the A-2 Reservoir and A-2 STA. Boat ramps and parking used by the public would also be used for operations and maintenance purposes. Other recreational amenities include access gates, picnic tables and restroom facilities. See **Figure 6-3** for the public access routes and sites associated with the CEPP PACR TSP.

Figure 6-3. CEPP PACR TSP Public Access Sites and Routes

6.2 PLAN ACCOMPLISHMENTS

6.2.1 Environmental Benefits

The CEPP PACR has been formulated to address the following problems and opportunities:

- High-volume damaging freshwater discharges from Lake Okeechobee to the Northern Estuaries.
- Need for additional freshwater flow to the Everglades system.
- Identify the next increment of storage, treatment and conveyance south of Lake Okeechobee to reduce ongoing ecological damage to the Northern Estuaries and Everglades system.

For this CEPP PACR TSP, the authorized CEPP, along with other CERP and non-CERP projects within the study area that have been authorized, are under construction, or are completed, are assumed to be in place and operational in the FWO project condition.

The CEPP PACR TSP successfully reduces high-volume freshwater discharges from Lake Okeechobee, adding to the beneficial effects of the CEPP plan for approximately 86,000 acres in the Caloosahatchee and St. Lucie Estuaries; provides improvements to approximately 480,000 acres of Florida Bay; and provides benefits from redirected flows to over 1 million acres of freshwater wetlands of the Greater Everglades. Applying the same methodology to quantify ecosystem benefits that was used in development of the authorized CEPP plan, the TSP would provide an increase of 28,768 average annual HUs compared to the FWO project condition for the period of analysis.

The TSP would further decrease high-volume freshwater discharges from Lake Okeechobee that are currently sent to the Northern Estuaries beyond the expected improvements that would be achieved by the authorized CEPP plan. Further increases in additional water from Lake Okeechobee would be sent south through improvements to the existing NNR and Miami Canals to the new A-2 Reservoir and A-2 STA (in lieu of the A-2 FEB in the authorized CEPP plan). The new A-2 Reservoir would provide storage capacity and attenuation of high flows, and the new A-2 STA, with existing STAs (STA 2 and STA 3/4) would reduce phosphorus concentrations in the water to meet required water quality standards. The TSP for this CEPP PACR would not modify or alter any other features of the authorized CEPP plan or Restoration Strategies—leaving the A-1 FEB in place. The additional treated water provided by the TSP is essential to Everglades restoration. The CEPP PACR, along with the authorized CEPP and other authorized projects, would deliver approximately 370,000 ac-ft of new water on an average annual basis to the central Everglades to restore more natural quantity, timing and distribution of water to WCA 3A, ENP, and Florida Bay. As authorized in the CEPP plan, several existing levees, canals, culverts, and pump stations would be constructed, modified, or removed to improve the flow of water through the system and provide for other water related needs, including the additional water that would be provided by the TSP.

Based on application of the same environmental benefit model used in the CEPP planning process, the CEPP PACR TSP would produce an increase in average annual habitat units over the authorized CEPP plan. **Table 6-2** provides a comparison, by CEPP region, of the average annual habitat units for CEPP and for the CEPP PACR TSP.

Table 6-2. Comparison of Average Annual Habitat Units (HUs) for CEPP and PACR TSP

Project Region (Zone)	CEPP Plan HUs [1]	Alt C240A (PACR TSP) HUs	Alt C240A (PACR TSP) HU Lift	Percent Increase
Caloosahatchee Estuary (CE-1)	39,038	41,168	2,130	
St. Lucie Estuary (SE-1)	8,247	9,296	1,049	
Total Northern Estuaries	**47,285**	**50,464**	**3,179**	**6.7%**
WCA 3A Northeast (3A-NE)	91,372	95,076	3,704	
WCA 3A Miami Canal (3A-MC)	54,746	59,438	4,692	
WCA 3A Northwest (3A-NW)	54,198	57,013	2,815	
WCA 3A Central (3A-C)	111,159	111,159	0	
WCA 3A South (3A-S)	68,423	69,247	824	
WCA 3B (3B)	59,125	59,982	857	
ENP North (ENP-N)	97,596	98,847	1,251	
ENP South (ENP-S)	169,400	171,786	2,386	
ENP South East (ENP-SE)	83,764	83,764	0	
Total WCA 3 and ENP	**789,783**	**806,312**	**16,529**	**2.1%**
Florida Bay West (FB-W)	41,100	44,200	3,100	
Florida Bay Central (FB-C)	13,950	15,600	1,650	
Florida Bay South (FB-S)	28,300	30,300	2,000	
Florida Bay East Central (FB-EC)	34,300	36,100	1,800	
Florida Bay North Bay (FB-NB)	2,660	2,790	130	
Florida Bay East (FB-E)	9,820	10,200	380	
Total Florida Bay	**130,130**	**139,190**	**9,060**	**7.0%**
Total All CEPP Regions	**967,198**	**995,966**	**28,768**	**3.0%**

[1] CEPP PACR – HU numbers calculated for CEPP PACR FWO (which includes authorized CEPP plan). Total HU lift for CEPP plan compared to FWO CEPP was 285,689 HUs (from CEPP PIR)

Based upon average annual costs for the CEPP plan and the CEPP PACR TSP from **Table 6-10** below, **Table 6-3** compares the cost per habitat unit for CEPP and for the CEPP PACR TSP. The CEPP PACR TSP costs per habitat unit are presented for (1) total cost and cumulative lift for CEPP, as modified by the TSP, and (2) incremental cost and habitat unit lift for the CEPP PACR TSP above the CEPP plan.

Table 6-3. Average Annual Cost/Habitat Unit for CEPP and CEPP PACR TSP

Plan	Average Annual Cost (2018 Price Levels)	Average Annual HU Lift	Average Annual Cost/HU
Authorized CEPP Plan	$106,165,000	285,689 [1]	$371
CEPP PACR TSP (Total Cost and Cumulative HU Lift)	$143,104,000	314,457 [2]	$455
CEPP PACR TSP (Incremental Cost and HU Lift)	$36,939,000	28,768	$1,284

[1] Represents the HU lift provided by the authorized CEPP plan compared to the CEPP FWO
[2] Represents the cumulative HU lift provided by the authorized CEPP plan, as modified by the TSP, compared to the FWO CEPP

The TSP would provide the next increment of improvement upon restoration of ecosystem function in the Caloosahatchee and St. Lucie Estuaries expected under the authorized CEPP plan by further reducing the number, severity and frequency of regulatory releases of freshwater from Lake Okeechobee to the Northern Estuaries. As depicted in the top of **Figure 6-4,** the TSP would reduce the number of damaging discharges to the Caloosahatchee Estuary (number of months flow was greater than 2,800 cfs from the C-43 Basin and Lake Okeechobee regulatory releases) by nine additional events over the FWO (**Table 6-4).** The TSP would reduce the number of damaging discharges to the St. Lucie Estuary (number of months flow was greater than 2,000 cfs from Lake Okeechobee regulatory releases) by seven additional events over the FWO (**Table 6-4).** At the bottom of the **Figure 6-4**, the number of damaging discharge events lasting longer than four consecutive months is reduced from six events in the FWO to three events in the TSP. **Figure 6-5** shows the reduction in damaging discharges to the St. Lucie (number of times 14-day moving average flow is greater than 2,000 cfs from Lake Okeechobee regulatory releases) by 14 events over the FWO. At the bottom of the **Figure 6-5**, the number of discharge events lasting longer than four consecutive months is reduced from nine events in the FWO to four events in the TSP.

Table 6-4. Incremental Change as a Result of the CEPP PACR TSP in the Reduction in Duration of High Volume Freshwater Discharges from Lake Okeechobee to the Northern Estuaries

High Volume Freshwater Discharges from Lake Okeechobee	FWO (CEPP) Number of Months	CEPP PACR TSP Number of Months	Difference in Number of Months	% Difference from FWO
St. Lucie Estuary (Mean Monthly Flows above 2000 cfs)	56	49	7	13%
St. Lucie Estuary (Mean Monthly Flows above 3000 cfs[1])	24	21	3	13%
Caloosahatchee Estuary (Mean Monthly Flows above 2800 cfs)	70	61	9	13%
Caloosahatchee Estuary (Mean Monthly Flows above 4500 cfs[1])	29	24	5	17%

[1] Note: The higher flow number is cumulative and includes all high-volume flow events.

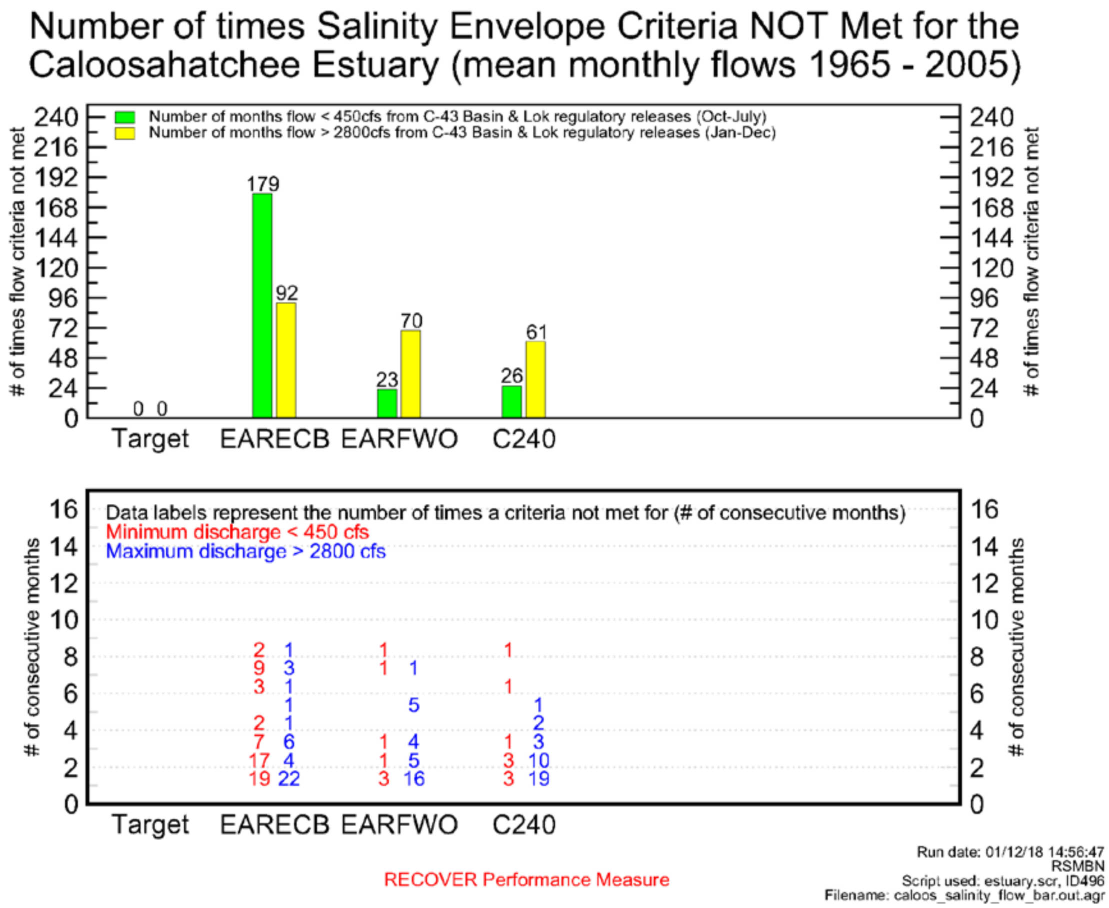

Figure 6-4. Number of Times Salinity Criteria not met for the Caloosahatchee Estuary for the ECB, FWO Project Condition, and the CEPP PACR TSP

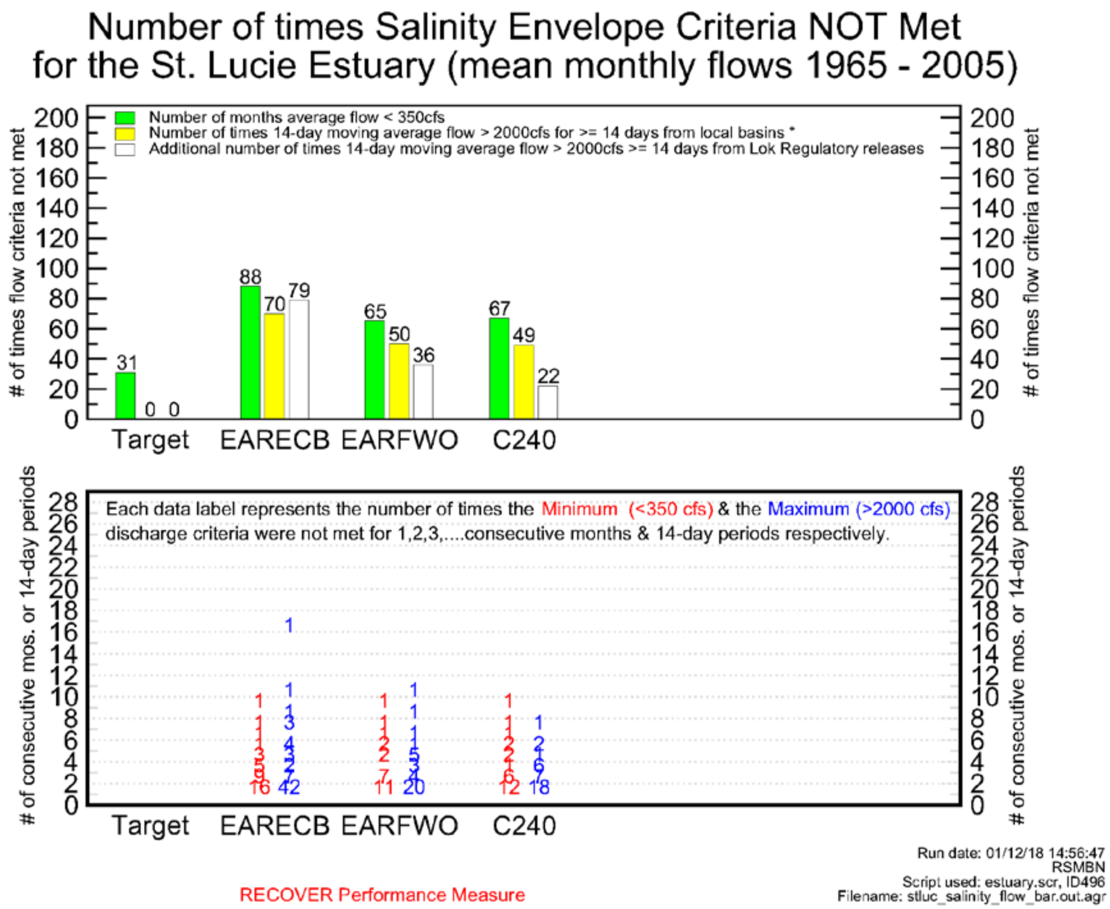

Figure 6-5. Number of Times Salinity Criteria not met for the St. Lucie Estuary for the ECB, FWO Project Condition, and the CEPP PACR TSP

The TSP provides an overall 55% reduction in discharge volumes and a 63% reduction in the number of discharge events to the Northern Estuaries from Lake Okeechobee, in conjunction with other authorized projects. High-flow discharges lasting more than 60 days in the Caloosahatchee River Estuary or more than 42 days in the St. Lucie Estuary have been found to be particularly damaging to the oyster populations. Compared with the FWO, the additional storage and treatment proposed in the TSP would reduce the number of these discharges by an additional 40% in the Caloosahatchee Estuary and 55% in the St. Lucie Estuary. The reduction in discharges improves the salinity conditions in the estuaries by reducing the number of events that exceed the preferred salinity envelope by 39% in the St. Lucie Estuary and by 45% in the Caloosahatchee Estuary.

Currently, many oyster and seagrass beds are stressed and have been reduced or eliminated from their former areas by extreme salinity fluctuations. A reduction in the number of high-volume freshwater discharges to the estuaries would help to reduce this associated stressor that is extremely detrimental to estuarine communities. Reductions in turbidity, color, and sedimentation would also allow greater light penetration, promoting the growth of seagrass beds and would help lessen the problem of the killing of adult oysters and the flushing of oyster spat into outer areas of the estuaries that currently experience high salinity levels during the dry season resulting in increased predation and disease in the oyster population. Implementation of the TSP provides an additional increment of the benefits envisioned in both CERP and CEPP, and builds upon those achieved in the Northern Estuaries with implementation of other CERP projects (i.e., CEPP, C-43 West Basin Storage Reservoir, and IRLS Project).

The benefits provided to the Northern Estuaries per the performance graphics below help further describe reduction in damaging discharges from Lake Okeechobee. Improvements to estuarine resiliency is elucidated through the reduction of the number of events over time that exceed the flow rate which cause negative effects to oyster recruitment and survivorship.

The TSP would provide an increase in the quantity of freshwater flowing into the historic Everglades flow path to approximately 370,000 ac-ft per year on an average annual basis. This additional freshwater flow is essential to Everglades restoration and would add another increment of benefits to Everglades restoration. In the historic system, the inundation pattern supported an expansive system of freshwater marshes including long hydroperiod sawgrass “ridges” interspersed with open-water “sloughs”, higher elevation marl prairies on either side of SRS, and forested wetlands in the Big Cypress Marsh. Other authorized features of the CEPP plan would reduce compartmentalization and fragmentation of the Everglades landscape, thus facilitating the resumption of sheetflow and related patterns of hydroperiods and water depth that would benefit from deliveries of additional water from the proposed TSP reservoir and significantly help restore and sustain the microtopography, directionality, and spatial extent of ridges and sloughs, and improve the health of tree islands within the landscape. Additional water flowing into the Everglades would also result in beneficial shifts in habitat for desired wildlife species. Implementation of the TSP features and additional flow would provide greater project benefits, especially to those areas located in northern WCA 3A. As modeled by the RSM-GL and LECSA (version 2.3.2) for the period of simulation (1965–2005), differences in hydroperiods and stage between the TSP and the FWO project condition show that the TSP would provide longer hydroperiods and greater overland flow volumes, especially in NW WCA-3A. There has been a large amount of soil lost in this region. Increased hydroperiods would slow the rate of soil oxidation and decrease the extent of damaging peat fires. The TSP would provide an added benefit to wading birds, such as wood storks and white ibis, in the region due to expanding foraging times and prey densities.

The authorized CEPP plan is expected to rehydrate northern WCA 3A by providing additional water and a means for redistributing that water in a manner that promotes sheetflow, and by removing the drainage effects associated with the Miami Canal. This would promote the reversal of soil loss and would help in the restoration of organic soil accretion. The TSP would add to these benefits by providing additional new water to further facilitate restoration in the northern WCA 3A. Additional water from the TSP would likely result in benefits within the central WCA 3A due to slight increases in overland flow volumes. The southern WCA 3A would remain largely unaffected by the TSP as compared to the FWO (**Figure 6-6**).

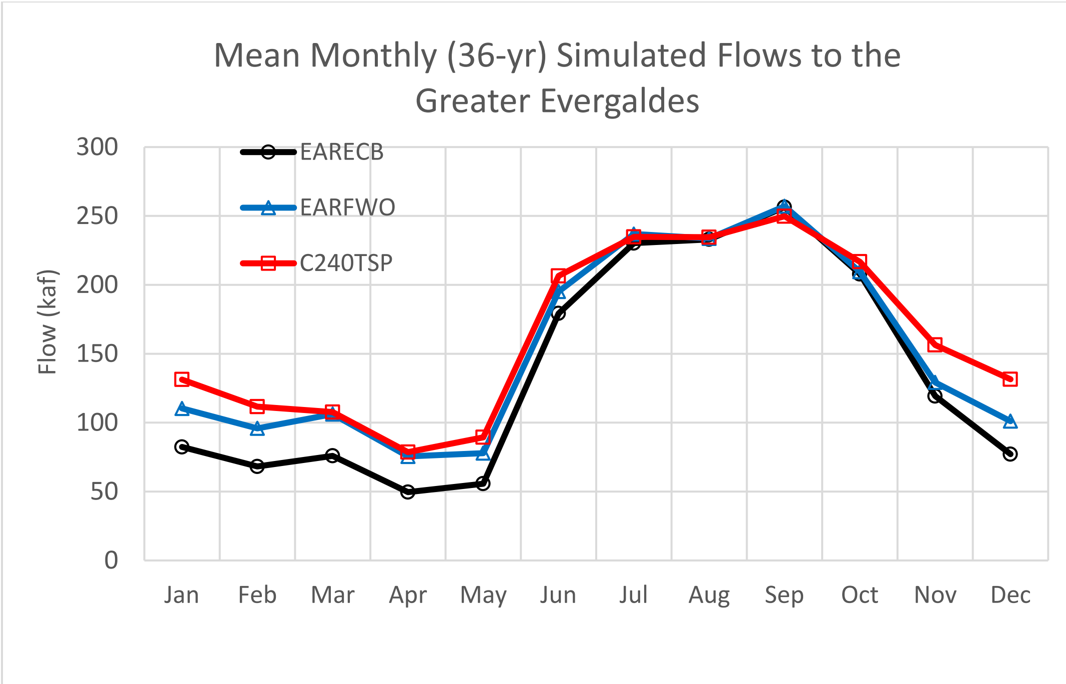

Figure 6-6. Timing of Treated Flows South into the Greater Everglades

The authorized CEPP plan would provide additional new water and begin to re-establish hydrologic connectivity of WCA 3A, WCA 3B, and ENP. Increases in stages and hydroperiods would promote wetland vegetation transition, through contraction of sawgrass marshes and expansion of wet prairies and sloughs. Additional water provided by the TSP would facilitate the expected improvement.

The authorized CEPP plan is expected to rehydrate much of the NESRS by providing a means for redistributing flows from WCA 3A through WCA 3B to ENP. Restoration of flow volumes would significantly improve hydroperiods and water depths while reducing the frequency and severity of dry downs. Additional flow volume provided by the TSP would provide additional improvement to hydrological conditions in this area.

The additional water provided by the TSP would improve conditions over those produced by the currently authorized CEPP plan. Similar to the authorized CEPP plan, the TSP does not reconnect SRS to Taylor Slough or Florida Bay as it was historically, but it would allow additional surface water to flow southeastward around Mahogany Hammock towards West Lake, the Lungs, and Garfield Bight helping to negate the harmful buildup of hypersalinity. This is expected to help restore the bay to more natural conditions and increase biomass and diversity of bay flora and fauna including ecologically and economically important pink shrimp and spotted sea trout, and desired seagrass species.

Further information pertaining to the evaluation of the TSP is described in **Appendix G**.

6.2.2 Contribution to Achievement of Interim Goals and Interim Targets

Section 601(h)(3)(C)(III) of WRDA 2000 (P.L. 106-541) required that CERP promulgate Programmatic Regulations which would include the "establishment of interim goals to provide a means by which the restoration success of the Plan may be evaluated throughout the implementation process." Section 385.38 of the Programmatic Regulations (33 CFR Part 385) describes the intent and the underlying principles for establishing interim goals and a process for their development. Recommendations for interim goals and interim targets were developed by RECOVER in 2005. An intergovernmental agreement signed in 2007 among the USACE, DOI, and SFWMD established interim goals for CERP. Section 385.39 also established the requirement to develop interim targets to measure progress toward meeting other water-related needs of the south Florida region, and described the intent, underlying principles, and the process for establishing interim targets. An agreement signed in 2007 between the USACE and SFWMD established interim targets.

The Programmatic Regulations also required that each project implementation report describe how the project contributes to the achievement of interim goals and interim targets (s. 385.26(a)(3)(xv)). Quantitative and qualitative predictions based on results from the RECOVER-approved performance measures, information gained from additional ecological planning tools, and best professional judgment was used to evaluate the progress towards the interim goals.

6.2.2.1 Progress Toward Interim Goals

Each of the performance measures for the CEPP planning effort was derived from those approved for use in CERP by RECOVER. This CEPP PACR evaluated a subset of the same performance measures. Detailed information about the performance measures and the methodology that was used to quantify ecosystem benefits through the Habitat Unit evaluation, the support plan evaluation, and selection of the TSP can be found in **Appendix G**. Additional information on the ecological benefits of the TSP can be found in **Appendix C**. The CEPP Planning Model, used to evaluate Habitat Units, underwent peer review per EC 1105-2-412 (Assuring Quality of Planning Models) and was recommended for single-use by the National Ecosystem Restoration Planning Center of Expertise and was approved by the HQUSACE Model Certification Panel. Outputs from the regional hydrologic models used in plan formulation (RSM-BN and RSM-GL) were also used to evaluate and help quantify the progress of CEPP, as modified by the TSP, towards meeting interim goals. The RSM-BN and RSM-GL were approved for use through the current USACE Engineering software validation process. **Table 6-5** is a summary of the effects of the TSP on the interim goal indicators. Most analyses compare the TSP to the FWO project condition. When “ac-ft” are cited, this refers to an analysis of an average-annual water budget over the 41-year period of hydrologic model simulation (1965–2005).

Table 6-5. Progress Toward Meeting Interim Goals (IGs)

Northern Estuaries Indicators
1.1 American Oysters: Increase areal coverage of American oysters in the Caloosahatchee and St. Lucie estuaries, Acres of Oysters from the FWO to the TSP will show positive progress toward meeting the CERP interim goal of increasing acres of oysters in St. Lucie Estuary and Caloosahatchee River Estuary. For more details, see **Appendix C**.
1.2 Submerged Aquatic Vegetation: Increase the areal coverage and improve the functionality of submerged aquatic vegetation in the Northern Estuaries Incremental reductions in high-flow violations to both estuaries indicate improved salinity and water quality conditions which should in turn result in positive progress toward meeting the CERP interim goal of SAV areal coverage increase.

Table 6-5. Progress Toward Meeting Interim Goals (IGs) (continued)

Northern Estuaries Indicators
1.3 Flows: Reduce high and low volume flows to the Caloosahatchee Estuary: High volume flows (>2,800 cfs) to the Caloosahatchee Estuary were reduced from 70 months in the FWO to 61 in the TSP. High Flows (>4,500 cfs) were reduced from 29 in the FWO to 24 in the TSP. Incidences of low-volume flows (<450 cfs) increased slightly from 23 months in the FWO to 26 months in the TSP. **Reduce high and low volume flows to the St. Lucie Estuary:** The number of events where the 14-day moving average flow exceeded 2,000 cfs occurred 36 times in the FWO, and was reduced to 22 times in the TSP. Mean Monthly flows of greater than 3,000 cfs occurred 24 times in the FWO and were reduced to 22 times in the TSP. The number of months where average monthly flows <350 cfs occurred was 65 months in the FWO, and increased very slightly to 66 in the TSP.
Greater Everglades Indicators
3.1 Water Volume: Distribute water across the ecosystem in a manner that reflects natural conditions while providing for other water-related needs of the region Overland flow volumes in the TSP would increase by 47,000 ac-ft in the NW WCA-3A, by 47,000 ac-ft in the NE WCA-3A, and by 7,000 ac-ft in the Southern ENP to nearshore Florida Bay (Transect 23). The rest of the Greater Everglades saw no differences between the TSP and the FWO.
3.2 Sheetflow in Natural Areas: Establish more historic magnitudes and directions of sheetflow in the natural areas of the Everglades The TSP would produce similar or the same magnitudes and direction of sheetflow as the FWO.
3.3 Hydropattern: Restore the natural timing and pattern of inundation throughout the ecological communities of South Florida, including sawgrass plains, ridge and slough and marl marshes In general, the TSP would produce similar or the same timing and pattern of inundation as the FWO. The only exception would be in NW and NE WCA-3A where the inundation duration would increase by 2% to 5%.
3.4 System-Wide Spatial Extent of Habitat: Increase spatial extent of natural habitat There would be no spatial extent increase of natural habitat in the Everglades Protection Area beyond what was specified in the FWO. However, converting 4,155 acres of agricultural lands to STA would result in additional improved freshwater wetland habitat.
3.6 Periphyton Mat Cover, Structure, and Composition: Restore periphyton mat cover, structure and composition that were characteristic of the spatially distinct hydroperiods (short and long hydroperiods) and low nutrient conditions in the greater Everglades wetland communities Periphyton monitoring has shown that the continued input of above-ambient phosphorus concentrations will both increase severity of enrichment effects near canals and cause these effects to continue to cascade downstream. The TSP would not exceed the above-ambient phosphorus concentrations, but in areas with volumes of water significantly increase such as NW WCA-3A, the total load of phosphorus may impact periphyton mat cover, structure, and composition but in areas where improved water quantity provides more TP loading, such as NW WCA-3A, periphyton are expected to show changes in mat cover, structure and composition consistent with improved water conditions.
3.7 Ridge and Slough Pattern: Restore the historical ridge and slough landscape directionality and pattern The TSP would provide an improved hydrologic pattern compared with the FWO because it would move more water to the NW section of WCA-3A. The active Adaptive Management Plan associated with CEPP and TSP would enhance restoration of the historical ridge and slough landscape directionality and pattern.

Table 6-5. Progress Toward Meeting Interim Goals (IGs) (continued)

Greater Everglades Indicators (continued)
3.8 Everglades Tree Islands: Improve tree island health and maintain healthy tree islands The TSP would maintain the hydrology and stage durations that is protective of tree islands throughout the Greater Everglades accept for minor increases in hydroperiods in the NE section of WCA 3A.
3.9 Aquatic Fauna Regional Populations in Greater Everglades Wetlands: Increase the abundance of fish to levels that approximate those predicted for pre-drainage conditions With the TSP, small fishes (up to ~8 cm) are expected to slightly increase in abundance over the FWO in the northern regions of WCA 3A and in NESRS in the ENP.
3.10 American Alligator: Restore more natural numbers and distribution patterns for alligators across South Florida's major freshwater and estuarine landscapes With the TSP, alligators are expected to slightly increase in abundance over the FWO in the northern regions of WCA 3A and in NESRS in the ENP.
3.11 System-Wide Wading bird nesting patterns: Increase the total number of nesting pairs, the percentage of wading bird pairs nesting in estuarine locations and the frequency of super colony events and establish conditions that encourage wood storks to initiate nesting earlier in winter Wood stork foraging suitability improved with CEPP in NE WCA 3A and would increase slightly with this TSP. No substantial benefits would occur within northwest WCA 3A and WCA 3B and southeast ENP in comparison to the FWO. It is predicted that southern ENP may become more suitable foraging habitat for wood storks due to the slight increase in flow volumes in the TSP, making it possible they would start nesting in this location once again.
3.12 Snail Kite: Increase the areal extent of suitable foraging for snail kites The TSP would result in reduced frequency and duration of extreme low lake stages on Lake Okeechobee, slightly longer hydroperiods and desirable vegetation shifts within northwestern WCA 3A. Conversion of A-2 Expansion area to treatment wetlands could increase suitable habitat for apple snails, thereby increasing spatial extent of suitable foraging opportunities for snail kites.
3.13 Flows to Northern Boundaries of the WCAs: Provide more natural surface water flows to the northern boundaries of the water conservation areas This TSP does not alter the FWO.
3.14 Flows to ENP: Provide more natural surface water flows to Everglades National Park The annual average overland flows into ENP provided by the TSP would increase by 94,000 ac-ft compared to the FWO.
Southern Estuaries Indicators
4.1 Salinity Patterns: Reduce the intensity, duration, frequency and spatial extent of high salinity events, reestablish low salinity conditions in mainland nearshore areas, and reduce the frequency of a rapidity of salinity fluctuations resulting from pulse releases of fresh water from canals The TSP would reduce the average annual salinity across the entire Florida Bay by only 0.2 to 0.5 psu. This reduction in salinity will contribute to the long-term health of the seagrass beds which will subsequently improve water quality as comparison to the FWO.
4.2 Submerged Aquatic Vegetation: Reestablish a diverse seagrass community with moderate plant densities and more natural seasonality, and increase the percentage of Florida Bay having suitable habitat for seagrass growth The TSP would reduce the average annual salinity across the entire Florida by only 0.2 – 0.5 psu. However, this slight improvement has long-term, significant habitat value for the preservation of the seagrass beds and for maintaining water quality in comparison to the FWO.

Table 6-5. Progress Toward Meeting Interim Goals (IGs) (continued)

Southern Estuaries Indicators (continued)
4.3 Juvenile Shrimp Densities: Increase densities of juvenile shrimp within the various basins of Florida Bay and Biscayne Bay The impact of the slightly improved salinity regimes in the Central and Western Florida Bay with this TSP on potential pink shrimp harvest is unknown.
4.4 American Crocodiles: Increase the frequency of salinities less than 20 parts per thousand in Florida Bay to foster optimal growth and survival of juvenile crocodiles Improved salinity regimes in north and central Florida Bay may result in a minor, long-term increase in the crocodile growth and survival.
4.5 Freshwater Flows to Florida Bay: Increase freshwater flows to Florida Bay Tidal outflows that increased with CEPP by an average of 144,000 ac-ft per year The flows to Florida Bay would increase slightly with the TSP compared with the FWO.
System-Wide Water Volume
5.1 Quantity of Freshwater Lost to Tide: Reduce the quantity of freshwater lost to tide The total reduction in water lost to tide in the Northern Estuaries is approximately 108,000 ac ft on an annual average basis compared to FWO. This represents a 28% reduction to Northern Estuary discharges compared to FWO.

6.2.2.2 Progress Toward Interim Targets

Each of the performance measures for the CEPP and CEPP PACR planning efforts were derived from those approved for use in CERP by RECOVER and are applied for interim targets. Output from the regional hydrologic models used in plan formulation (RSM-BN and RSM-GL) was also used to evaluate and help quantify progress towards meeting interim targets as a result of CEPP and the proposed TSP. **Table 6-6** is a summary of the CEPP's effects on the interim target indicators. The interim targets analyzed in this section are based upon the objectives of CEPP and CEPP PACR.

Table 6-6. Progress Toward Meeting Interim Targets

Indicators	Interim Target	Summary of the TSP's Effects
Water Volume	Distribute water across the ecosystem in a manner that reflects natural conditions while providing for other water-related needs of the region.	In general, improved spatial distribution to the natural system and associated environmental benefits will result from the implementation of the TSP.
Water Supply to Lower East Coast Service Area	Increase water supplies available for meeting existing and future water supply needs including the water supply rights of the Seminole Tribe of Florida, State of Florida, and the SFWMD.	Same as FWO.
Water Supply to Lake Okeechobee Service Area (LOSA)	Increase water supplies available for meeting existing and future needs including the water supply rights of the Seminole Tribe of Florida, State of Florida, and the SFWMD.	Same as FWO.

6.2.3 Ecosystem Services

Ecosystem services can be defined as the benefits human beings receive from resources and processes supplied by ecosystems (Murray et al. 2013). Some ecosystem services are material resources that can be used by people, such as food, timber, water, and medicine. Other ecosystem services come from ecological processes, such as carbon sequestration that results from the formation of peat soils. Describing ecosystem services helps capture a fundamental value of ecosystems - that they support human life on Earth.

Ecosystem services in the Northern Estuaries would include those related to aesthetics; biodiversity and species composition; commercial fishing; recreational fishing; other forms of recreation; tourism; ecological connectivity of landscapes; educational opportunities; water quality in terms of reduction in nutrients and sediment loads; and water quality in estuaries due to increased filtration by oysters.

There are notable published studies that attempt to estimate the economic value of some of ecosystem services provided by the estuaries in their present condition. Others examine the costs of reduction in environmental quality to society resulting from Lake Okeechobee discharges. This existing research is used below to provide a framework to assess the value of some of the ecosystem services provided by the Northern Estuaries; the costs to society resulting from Lake Okeechobee discharges; and the economic impact of the TSP.

In the FWO condition (which assumes that the authorized CEPP plan has been constructed and is operational), ecological conditions of the Northern Estuaries and other areas in the Greater Everglades system are expected to be improved as described in the CEPP PIR. Thus, there would be improvements in the level of ecosystem services provided as a result of CEPP implementation. The TSP presented in this CEPP PACR would be expected to add an increment of restoration by further reducing regulatory discharges to the Northern Estuaries and increasing the amount of water sent to the Greater Everglades.

The economic output attributed to the use of the St. Lucie Estuary and other connected inshore areas in Martin and St. Lucie Counties has been estimated to be $873 million per year. The analysis published as part of the *Indian River Lagoon Economic Update* (ECFRPC and TCRPC 2016) used an input-output model to consider the direct, indirect, and induced economic activity from four industry groups as defined under the North American Industry Classification System that are dependent on the ecosystem services provided by the estuary. The industry groups included: 1) Living Resources; 2) Marine Industries; 3) Recreation and Visitor-related; and 4) Resource Management. Notably, the economic activity generated though the Recreation and Visitor-related industry group accounts for almost half of the $873 million per year valuation.

The $873 million annual contribution of the St. Lucie Estuary is substantial, but it may be much less than the total value of the ecosystem services provided. The *Indian River Lagoon Economic Update* was limited in that it considered the value of the St. Lucie Estuary and other connected inshore areas through market activity. The total value of the ecosystem services provided by the estuary could be much greater than $834 million per year. The consideration of other markets (e.g., real estate), consumer surplus, and non-use values under a total economic value framework would provide a more complete assessment of the value of ecosystem services. [1]

A broad-based economic analysis comparable to *Indian River Lagoon Economic Update* (ECFRPC and TCRPC 2016) has not been published for the Caloosahatchee Estuary. However, some studies have

[1] See Letson and Milon (2002) for a description of consumer surplus, non-market valuation techniques, and the valuation of ecosystem service under a total economic value framework.

examined the economic activity attributable to the Caloosahatchee Estuary through individual industry groups, again using input-output models. One such study by Hodges et al. (2015) concluded that the Marine-related industries in Lee County that are dependent on the health of the estuary and the ecosystem services contributed $1.27 billion to the economy in 2013. Another study reported the Recreation and Visitor-related industry group employed one out of every three people in Lee County generating $3 billion in economic impact each year (Aitchison et al. 2017). Like the *Indian River Lagoon Economic Update*, both Hodges et al. (2015) and Aitchison et al. (2017) considered only the economic activity generated from selected industry groups. The total value the ecosystem services provided by the Caloosahatchee Estuary could be much greater than the combined $4.27 billion suggested by these two studies.

These valuation studies based on input-output models are based on the current condition of the estuaries. The examination of the change in the health of the estuaries and the change ecosystem services provided over time sheds additional light on the potential impact of the TSP. The large but incomplete valuations suggest that relatively small improvements in the health of the estuaries could also produce substantial economic benefits. At the same time, the overall health of the St. Lucie Estuary and the Indian River Lagoon has been in a long steady decline, and within the last 30 years the system has seen an 83% decrease in benthic organisms (Morris et al. 2016). Oyster beds that once covered approximately 1,400 acres are greatly diminished with live populations essentially eliminated in many areas across the estuary during high-rainfall events (Buzzelli et al. 2015). Seagrass has also seen a dramatic decline. Researchers have assessed the value of seagrass within the St. Lucie Estuary and the Indian River Lagoon at $329 million per year or $4,600 per year per acre of seagrass (IRL 16 Update). Over the 50 years, at a 2% annual discount rate, the region's seagrass value would be $112,561 per acre.

There are limited analyses that attempt to quantify the economic impacts of specific high rainfall events leading to Lake Okeechobee discharges and local runoff. Most recently, the high rainfall and resulting damaging discharges to the Northern Estuaries during late 2015 and 2016 had a clear effect on tourism and recreation. A survey in the summer of 2016 conducted by Black Hills State University and the University of Florida's Tourism Crisis Management Initiative found that more than 70% of those with plans to visit Martin, St. Lucie, Lee, and Palm Beach Counties during the time of the harmful discharges planned to avoid travel to their originally planned destinations. Of the approximately 70% who indicated that they would change their plans, half postponed their travel plans and 32% opted to travel to alternative destinations. The results of this survey were supported by data on hotel occupancy rates in Martin County. Total rooms booked in the county in 2016 were 10,600 or 3.3% less than they were in 2015. The downturn in occupancy rates in Martin County occurred during a period (2015 to 2016) when room demand grew across the State approximately 1.2% (Martin County 2017). In another study, Florida Tax Watch estimated that the Lee County lost out on up to $185 million in tourist spending during the summer of 2016 due to the damaging discharges (Florida Tax Watch 2017).

This analysis provides the results of a rigorous review of pertinent documentation attempting to quantify the substantial value provided by benefits from ecosystem services. The results of this analysis, however, revealed incomplete and sometimes difficult to define values making the effects of the TSP difficult to quantify. The SFWMD believes that the analysis presented in this section, while containing significant uncertainty, represents an appropriate level of analysis of ecosystem services benefits that can be justified given the information available.

6.3 ENVIRONMENTAL CONSIDERATIONS

6.3.1 Water Quality for Lake Okeechobee, the Northern Estuaries, and Water Conservation Area 3A

The TSP is not expected to affect Lake Okeechobee water quality. The Northern Estuaries should see improvements in salinity that result from additional reduced high flow events in the TSP as compared to the FWO and its associated Lake Okeechobee operations.

Due to improved hydropattern as a result of the TSP, there would be reduced incidence of dry out of the northern marsh in WCA 3A which would limit peat oxidation and nutrient re-mobilization, potentially leading to lower downstream nutrient concentrations in southern WCA 3A. The increased flows within WCA 3A resulting from the TSP compared to expected changes in flow and flow patterns for the FWO would likely cause a negligible increase to nutrient loading in northern WCA 3A.

6.3.2 Water Quality for Everglades National Park and the Southern Estuaries

Water entering ENP at the northern end of SRS from WCA 3A as a result of the TSP would have comparable concentrations of TP as compared with the FWO condition. It is uncertain how changes in flow distributions proposed would impact compliance with Appendix A of the 1991 Settlement Agreement. Details regarding the Settlement Agreement and the State's efforts to achieve compliance with the requirements of the Settlement Agreement are discussed in Section 6.3.2 of the CEPP PIR. The TSP is expected to further improve marsh hydroperiods over FWO conditions, which would reduce the risk of downstream TP spikes caused by dry-out and rewetting. Effects to the Southern Estuaries would be a slight decrease in average salinity conditions.

6.3.3 Cumulative Impacts

Cumulative environmental effects for the proposed action were assessed in accordance with guidance provided by the President's Council on Environmental Quality. The primary goal of cumulative effects analysis is to determine the magnitude and significance of the environmental consequences of the proposed action in the context of the cumulative effects of other past, present, and future actions. **Table 6-8** (at the end of this section) shows the net cumulative effects of the various resources that are directly or indirectly impacted. CEPP and the TSP presented in this CEPP PACR are expected to contribute to a net beneficial cumulative impact on the regional ecosystem. Further information on cumulative effects can be found in **Appendix C.2.2.20.**

For this CEPP PACR, CEPP and other CERP and non-CERP actions in the study area that have been authorized, are under construction, or are completed are assumed to be in place and operational in the FWO condition. Perhaps the largest and most important reasonably foreseeable future actions not accounted for in the FWO condition are the ongoing feasibility level studies for the LOWRP, the WERP, and development of the Combined Operating Plan (COP) for MWD and C-111 South Dade projects.

The LOWRP study is scheduled for completion in 2019. LOWRP is a USACE/SFWMD CERP planning study to identify opportunities to improve the quantity, timing, and distribution of flows in the Lake Okeechobee planning area including the 730-square-mile lake. The project planning area, where placement of potential management measures are being considered, covers a large portion of the Lake Okeechobee Watershed north of the lake (see **Figure 6-7**). Objectives for the project include:

- Increase water storage capacity in the watershed, resulting in improved Lake Okeechobee water levels

- Improve the quantity and timing of discharges to the Caloosahatchee and St. Lucie estuaries downstream of Lake Okeechobee
- Restore wetlands
- Improve existing and future water supply.

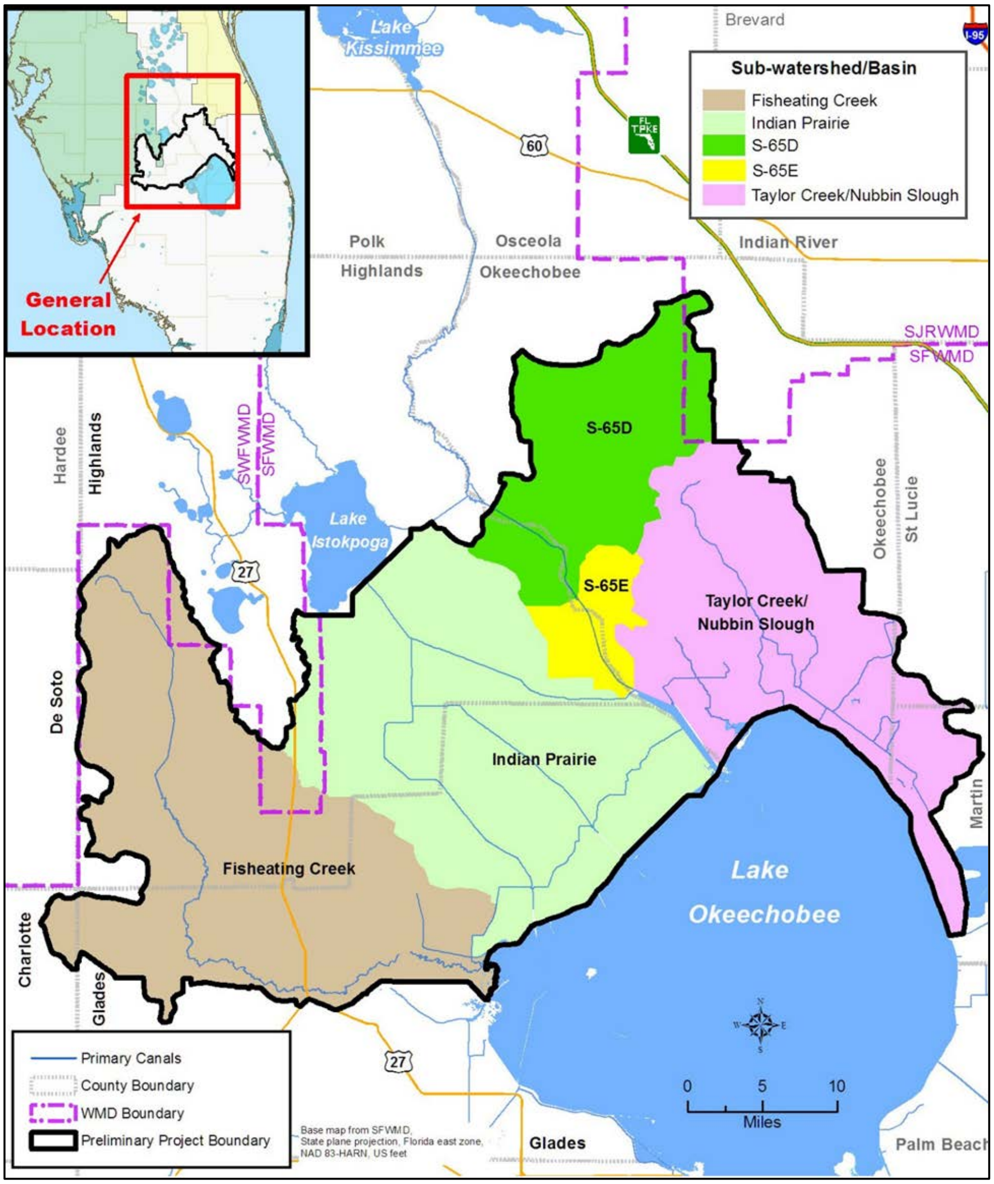

Figure 6-7. Lake Okeechobee Watershed Restoration Project Study Area

Water inflows into Lake Okeechobee frequently exceed outflow capacity, and as a result, there is often more water in Lake Okeechobee than can be released in order to ensure the integrity of the HHD. At other times, there may be too little water within Lake Okeechobee. Lake levels that are too high or too low, and inappropriate Lake recession and ascension rates, can adversely affect native vegetation, and fish and wildlife species that depend upon the lake for foraging and reproduction. The volume, duration and return frequency of damaging freshwater releases from Lake Okeechobee to the Northern Estuaries severely impacts oysters, sea grasses, and fish. In the LOWRP, the USACE and SFWMD are formulating a project plan to help keep Lake Okeechobee in the desired ecological zone, moderate rapid ascension and recession rates and to reduce damaging discharges to the Northern Estuaries consistent with the CERP goals. Management measures currently under consideration include a combination of surface water storage reservoirs, wetland restoration, and aquifer storage and recovery wells.

The LOWRP will complement authorized and proposed CERP projects including the CEPP PACR TSP to improve conditions in Lake Okeechobee and Northern Estuaries. To demonstrate this, a LOWRP sensitivity analysis was conducted with the TSP of this PACR coupled with the CERP North of Lake Okeechobee Storage Reservoir (Component A – 200,000 ac-ft) and 80 of the CERP Lake Okeechobee Aquifer Storage and Recovery (Component GG) wells to determine additional Lake Okeechobee and Northern Estuary benefits. From an effectiveness standpoint, the CEPP PACR TSP with LOWRP as defined above is very close to achieving the total CERP Goal in reducing damaging discharges to the Northern Estuaries and meets the CERP Goal for flows to the Everglades. This information on performance is summarized in **Table 6-7**.

Table 6-7. Effectiveness of CEPP PACR TSP with LOWRP in Achieving the CERP Goal for the Northern Estuaries

Metric (36-year POR)*	CERP Goal	CEPP PACR TSP	CEPP PACR TSP+LOWRP
Estuary Events	81% reduction	63%	86%
Estuary Flows	80% reduction	55%	78%
Flows to the Everglades	Increase of 323,000 ac-ft average annual	97%	99%

* Based on the 36-year modeled simulation period (1965-2000) available from RECOVER

This would be a great accomplishment in reducing damaging discharges to the Northern Estuaries considering the reduced number of Lake Okeechobee ASR wells in this analysis relative to the 200 ASR wells identified in CERP. Improvements in Lake ecology are also gained beyond the CEPP PACR TSP with storage north of the Lake. Detailed information on ecological improvements associated with this sensitivity analysis including performance measure graphics can be found in **Appendix C.2.2.21**. In addition to these improvements, two general conclusions can be drawn from this analysis:

1. CEPP PACR TSP and LOWRP benefits are complementary. Although parallel planning efforts may illustrate similar trends between the two efforts, the combined effect of the projects is additive, not coincident.
2. The combination of the CEPP PACR TSP and a LOWRP project can come close to or fully achieve the CERP Goal in the Northern Estuaries (Lake Okeechobee and water supply performance are also generally consistent or improved compared to CERP).

The Western Everglades Restoration Project will identify a plan that will improve the quantity, quality, timing, and distribution of water needed to restore and reconnect the western Everglades ecosystem. The project will use a series of water quality treatment features, operational changes and engineering opportunities to re-establish sheetflow from the West Feeder Canal Basin through historic overland flow paths including existing cypress sloughs into Big Cypress Seminole Indian Reservation and Big Cypress National Preserve all while maintaining existing levels of flood protection and meeting applicable water quality standards (**Figure 6-8**).

At the south end of the system, the USACE is developing a COP to define operations of the MWD to ENP and the C-111 South Dade projects, while maintaining the original authorized purposes of the C&SF Project. The COP will result in a comprehensive and integrated water control plan that will replace the previous version of the water control plan (USACE 2012c) for the WCAs, ENP, and South Dade Conveyance System features (**Figure 6-9).** This operational plan will also revisit the Rainfall Plan and implementation of the RDO that conveys restoration flows from WCA 3A to ENP as well as the regulatory schedule for WCA 3A. Additional information on rainfall drive operation is available in **Section 6.1.3.1**. RDO are necessary to achieve the CERP goals for Everglades restoration.

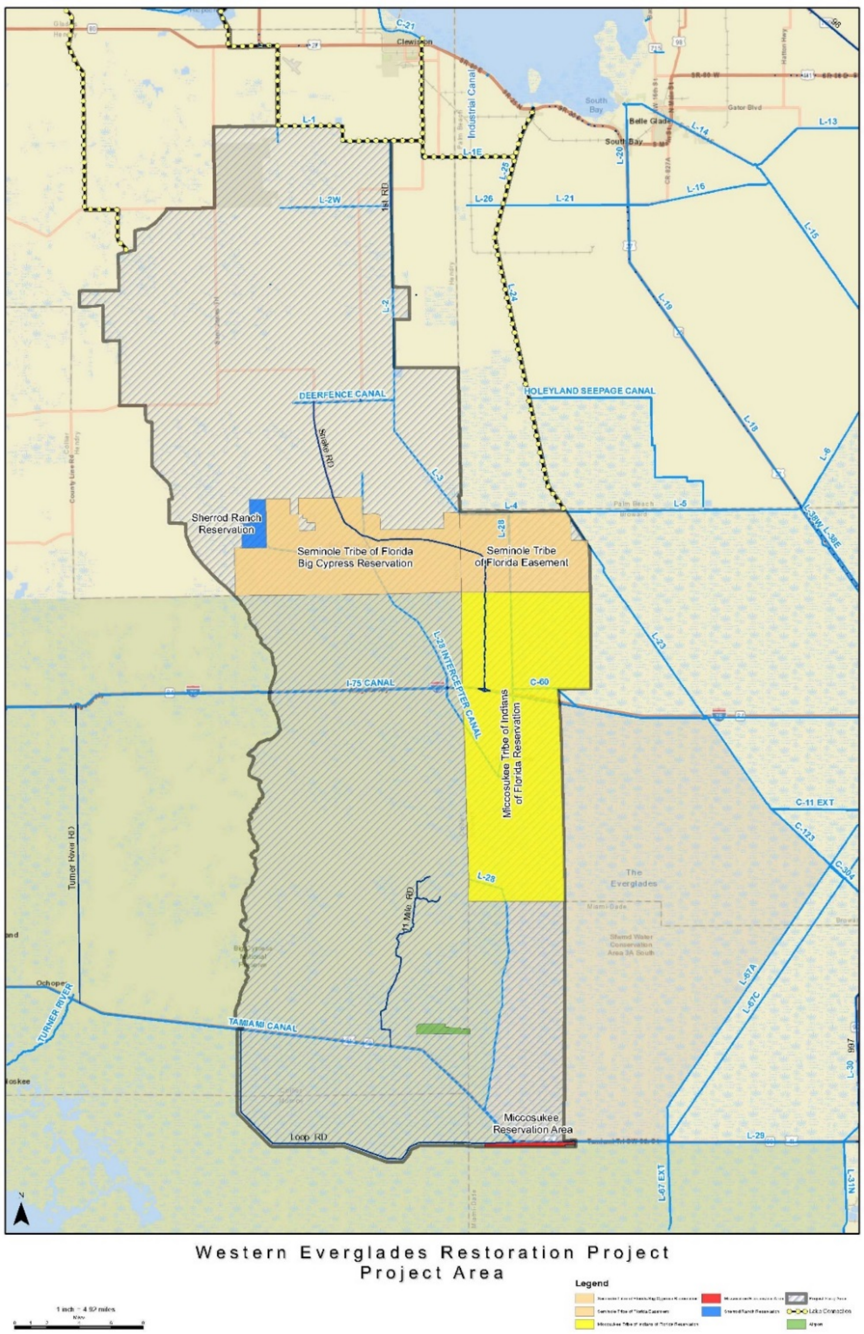

Figure 6-8. Western Everglades Restoration Project, Project Area

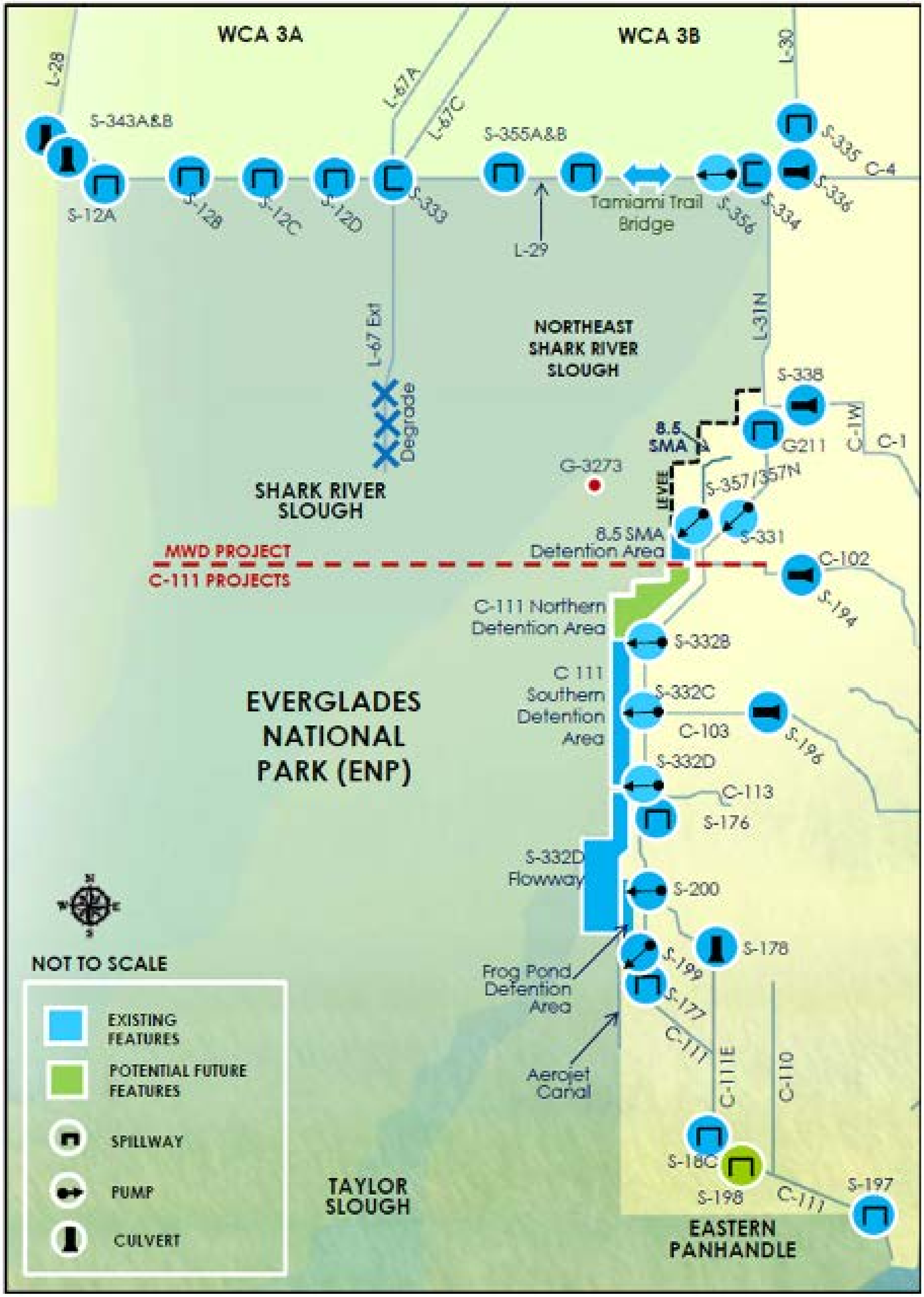

Figure 6-9. Combined Operating Plan, Project Area Features

Other CERP-related studies and projects may be initiated in the future to further support and extend restoration of the south Florida ecosystem.

Table 6-8. Summary of Cumulative Effects

Hydrology	
Past Actions	Flood and water control projects have greatly altered the natural hydrology.
Present Actions	Federal and State agencies are coordinating on and implementing projects to improve hydrology.
Proposed Action (TSP)	Additional reductions in high discharge events from Lake Okeechobee to the Northern Estuaries would be realized by the TSP compared to the FWO. Further beneficial hydrologic effects within the Greater Everglades compared to the FWO by way of additional "new water" to facilitate restoration of sheetflow and rehydration of previously drained areas. Improved hydrologic conditions will result from increasing depths and extending hydroperiods in WCA 3A, WCA 3B, and ENP.
Future Actions	Additional CERP projects propose to restore hydrology to more natural conditions (example – LOWRP and WERP).
Cumulative Effect	Although it is highly unlikely that natural hydrologic conditions would be fully restored to pre-drainage conditions in most of the Everglades, improved hydrology would occur. Improved resilience to the overall ecology of the Greater Everglades ecosystem should occur. CERP is expected to improve the quantity, quality, timing, and distribution of freshwater flow.
Threatened and Endangered Species	
Past Actions	Water management practices, importation of exotic species, and urbanization have resulted in the degradation of existing habitat function and direct habitat loss leading to negative population trends of threatened and endangered species.
Present Actions	Ongoing efforts have been made by Federal and State agencies to implement projects to improve hydrology within the project area. Ongoing projects have been implemented to maintain CSSS populations. The USFWS recovery plan is used as a management tool.
Proposed Action (TSP)	Effects on critical habitat would be similar to the FWO; as such the CEPP Adaptive Management and Monitoring Plans have been updated for the TSP (see **Annex D**).
Future Actions	Current actions would continue to be implemented to maintain threatened and endangered species within the project area. ERTP implementation represents a paradigm shift from single species to multi-species management. ERTP includes performance measures specifically directed at managing water levels and releases for the protection of multiple species and their habitats within the project area.
Threatened and Endangered Species	
Cumulative Effect	Habitat improvement, monitoring and management of threatened and endangered species are anticipated to allow populations to be maintained. Improvement of degraded populations is expected to be facilitated by the restoration and enhancement of suitable habitat through efforts to restore more natural hydrologic conditions within the project area.
Past Actions	Water management practices have resulted in aquatic vegetation community changes and a resultant disruption of aquatic productivity and function that has had repercussions through the food web, including effects on wading birds, large predatory fishes, reptiles and mammals.
Present Actions	Ongoing efforts have been made by Federal and State agencies to implement projects to improve hydrology within the project area to restore habitat conditions for fish and wildlife resources.

Table 6-8. Summary of Cumulative Effects (continued)

Fish and Wildlife Resources	
Proposed Action (TSP)	Negligible effects to fish and wildlife resources within Lake Okeechobee, and the EAA would be expected. Further reductions in the number of high discharge events to the Northern Estuaries, above reductions provided by the FWO, are anticipated to improve suitable habitat for key indicator species such as oysters and seagrasses. The TSP would provide additional beneficial effects within the Greater Everglades by sending increased levels of “new water” south above those provided by the FWO. Rehydration within previously dry areas of WCA 3A and ENP would increase the spatial extent of suitable habitat for several fish and wildlife resources. Increases in forage prey availability (crayfish, other invertebrates, and fish) would directly benefit amphibian, reptile, small mammal, and wading bird species. Nesting and foraging activities of resident bird species are anticipated to be significantly improved. Although mammals occurring within the affected area are adapted to the naturally fluctuating water levels in the Everglades, there would be minimal incremental effect on mammals currently utilizing upland habitat compared to the effects of the FWO. Further increased freshwater flows to Florida Bay would provide minor incremental improvement in suitable habitat for pink shrimp, juvenile spotted sea trout, sea turtles, manatee and crocodiles among other species.
Future Actions	Some level of improvement to fish and wildlife resources is expected to occur as a result of implementation of projects with the capability of improving the timing, quantity, quality, and distribution of freshwater flow to the study area. Hydrologic restoration planned as part of CERP would further improve fish and wildlife habitat.
Cumulative Effect	Habitat improvement efforts are anticipated to benefit fish and wildlife resources.
Vegetation and Wetlands	
Past Actions	Drainage of Florida’s interior wetlands, conversion of wetlands to agriculture, and urban development has reduced the spatial extent and quality of wetland resources.
Present Actions	Efforts are being taken by State and Federal regulatory agencies to reduce wetland losses.
Proposed Action (TSP)	Negligible effects to vegetation within Lake Okeechobee are anticipated. Further reductions in the number of high discharge events to the Northern Estuaries above those provided by the FWO are anticipated to further improve conditions for oyster and seagrass beds. In the A-2 Expansion area 4,155 acres of agricultural lands would be converted to freshwater wetlands improving the habitat. Additional beneficial effects are anticipated within the Greater Everglades above those provided by the FWO. Additional “new water” would further improve hydrologic conditions within WCA 3A and ENP and would support further reductions in soil oxidation, promoting peat accretion necessary to rebuild the complex mosaic of habitats across the landscape. Increased freshwater flows to Florida Bay would aid to lower salinity levels, benefiting mangrove communities and seagrass beds.
Future Actions	Some level of improvement to vegetative communities is expected to occur as a result of implementation of projects with the capability of improving the timing, quantity, quality and distribution of freshwater flow to the study area. More natural hydrology as part of the CERP would assist in restoring natural plant communities.
Cumulative Effect	While the spatial extent of natural plant communities would not be restored to historic proportions, the quality of vegetative communities would be improved.

Table 6-8. Summary of Cumulative Effects (continued)

Cultural Resources	
Past Actions	Flood and water control projects, conversion of wetlands into agriculture and urban development have had adverse unmitigated effects to cultural resources either directly or indirectly.
Present Actions	Ongoing efforts have been made by Federal and State agencies to implement projects to improve hydrology within the project area, thereby stabilizing the tree islands which are known to have a high potential for cultural resources.
Proposed Action (TSP)	Consultation with stakeholders, including the State Historic Preservation Office, Advisory Council on Historic Preservation, Seminole Tribe of Florida and the Miccosukee Tribe of Indians of Florida will be initiated by the USACE upon completion of this PACR.
Future Actions	Continued improvement to hydroperiods and sheetflow within WCA 3A, 3B and ENP could reduce soil oxidation, which could stabilize the environment, and this in turn could stabilize tree islands containing cultural resources.
Cumulative Effect	Cumulative effects to historic properties and culturally significant sites will potentially be long-term adverse effects if not avoided. Mitigation measures for effects to historic properties could potentially reduce the cumulative effect to minor long-term adverse effects. Mitigation measures for culturally significant sites are unknown.
Water Quality	
Past Actions	Water quality has been degraded from urban, suburban, commercial, industrial, recreational and agricultural development.
Present Actions	Efforts to improve water quality from agricultural areas is ongoing. Federal and State projects would temporarily elevate localized levels of suspended solids and turbidity.
Proposed Action (TSP)	Implementation of the TSP is not expected to significantly affect the water quality of Lake Okeechobee. In the Northern Estuaries, improvements to salinity should be seen due to further reductions in high-flow events. The increases in flow to WCA 3A and ENP as a result of the TSP should not affect TP Rule compliance. Over the long-term, adding more flow from the lake that is treated to the water quality based effluent limits (WQBEL) should result in improved water quality within WCA 3 and a reduction in flow- weighted mean total phosphorus concentration entering the Park. Southern Estuaries salinity conditions are expected to be slightly improved by the TSP.
Future Actions	Actions by the State of Florida’s Restoration Strategies would decrease nutrient concentration and loadings to the project area. Lake Okeechobee Regulation Schedule update and development of the Combined Operating Plan (COP) for Modified Water Deliveries, Western Everglades Restoration Plan, and the Broward County Water Preserve Areas (BCWPA) Project would also be expected to benefit water quality. Specifically, the BCWPA (Record of Decision signed in 2012, authorized in WRRDA 2014) would reduce storm runoff deliveries to WCA 3 and improve water quality coming across Tamiami Trail.
Cumulative Effect	While anthropogenic effects on water quality are unlikely to be eliminated, water quality is expected to improve over existing and recent past conditions. During detailed planning and design, the USACE and SFWMD are committed to ensuring that project feature implementation will not result in violations of water quality standards.

Table 6-8. Summary of Cumulative Effects (continued)

Water Supply/Flood Control	
Past Actions	Water supply and flood control for agricultural and urban users has benefited from construction and operation of the C&SF Project.
Present Actions	Availability of water from Lake Okeechobee for agricultural users was recently diminished through implementation of 2008 LORS. Availability of water for urban and agricultural users were recently diminished through implementation of ERTP. The SFWMD has implemented Restricted Allocation Area Rules to cap users dependent on water supplies from Lake Okeechobee and the regional system (the Everglades).
Proposed Action (TSP)	Additional storage or hydrologic improvements is expected to reduce the severity and duration of water restrictions.
Future Actions	Future supplies would not change unless additional storage or hydrologic improvements are implemented and increase water availability.
Cumulative Effect	While effects on water supplies are unlikely to improve, water supplies available for agricultural and urban users are expected to remain stable until additional storage mechanisms are implemented.

6.3.4 Incomplete or Unavailable Information

The analyses provided in this document are based upon current knowledge of the physical and biological conditions in the action area and on projections of the most probable future conditions, as indicated by hydrologic models. The SFWMD recognizes that there is uncertainty in the predictions derived from these models that stems from input variability and measurement errors, parameter uncertainty, model structure uncertainty and algorithmic (numerical) uncertainty. These uncertainties are also translated into uncertainty as to whether the specific performance indicators and measures used to characterize the overall system performance actually capture that overall performance. The outputs of the sub-regional hydrologic models used to assess projected hydrologic changes and to quantify ecosystem benefits were the best data available to predict the most likely hydrologic changes as a result of the project. Even though uncertainty is recognized, ecological benefits derived from performance measure metrics are useful in making planning level decisions. These values provide a quantitative means for comparing alternatives to identify the best performing alternative.

Technical information or models used in CEPP were applied in evaluating project alternatives. An AM approach during implementation of the TSP, documented in **Annex D**, will provide new information to address uncertainties and risks over time, decrease the potential for costly mistakes, and ultimately support fulfillment of restoration goals and objectives.

6.3.5 Unavoidable Adverse Environmental Effects

As discussed under each resource in **Section 5.2**, the incremental adverse effects associated with implementing the TSP compared to the FWO condition (which assumes the CEPP plan to be implemented) are expected to range from negligible to moderate. Potential unavoidable adverse impacts that would result from implementation of the TSP include temporary, short term impacts to air quality, the noise environment, and aesthetic resources from operation of construction equipment through lands designated for staging, access and construction. Temporary disturbances to and displacement of fish and wildlife resources to other nearby habitat would occur during construction within the agricultural fields and ditches.

Beneficial effects to fish and wildlife resources are anticipated under the TSP. Due to increased water flow and changes in water distribution, it is anticipated that overdrained areas in northern WCA 3A will be rehydrated, triggering a minor vegetation transition from upland to wetland habitat. Although mammals occurring within the action area are adapted to the naturally fluctuating water levels in the Everglades, there is a slightly increased potential that mammals currently utilizing upland habitat may be negatively affected.

Non-native and invasive plant infestations in the project area may be exacerbated by soil disturbance during construction in the construction footprint and may require active management. Implementation of the TSP is not expected to have an observable effect on non-native vegetative species as compared to the FWO.

Conversion of the A-2 lands from agriculture to a water storage reservoir and STA would result in the permanent loss of designated prime and unique farmland. The TSP provides a net gain of wetland acreage as a result of the construction of project features including construction of the A-2 STA.

Cultural Resource surveys will be completed prior to final design of the project. Pursuant to 36 CFR 800.1, where possible, the project design will be modified to avoid impacting significant historic properties and culturally significant sites. Where avoidance is not possible, other mitigation measures will be considered. If unavoidable resources are identified, mitigation measures will be developed during the PED phase in consultation with the SHPO, tribal groups, and other interested parties as established in implementing regulations for Section 106 of the NHPA.

6.3.6 Irreversible and Irretrievable Commitment of Resources

An irreversible commitment of resources is one in which the ability to use and/or enjoy the resource is lost permanently. An irretrievable commitment of resources is one in which, due to decisions to manage the resource for another purpose, opportunities to use or enjoy the resource as they presently exist are lost for a period of time. Construction of the proposed project will include features considered permanent and may be deemed irreversible. This would include project features in the EAA for storage and treatment features that would change the distribution and conveyance (location, direction, depth, volume, quality, timing and distribution) of the available water. Resources to be committed if the project is approved include expenditure of State and Federal funding, labor, energy and project materials to build, operate and maintain the proposed project.

6.4 COST ESTIMATES OF RESTORATION ELEMENTS

The goal of the cost estimates for the CEPP PACR TSP are to present a Total Project Cost (Construction and Non-Construction costs) for the authorized CEPP plus the PACR TSP at the current price level to be used for project justification/authorization. In addition, the costing efforts are intended to produce a final product (cost estimate) that is reliable and accurate and that supports the definition of the Government’s and the non-Federal sponsor’s obligations.

The cost estimate supporting the TSP was prepared using the MCACES/MII tool. This estimate is supported by the preferred labor, equipment, materials, and crew/production breakdown. The risk analysis addresses project uncertainties and sets contingencies for the TSP cost items. Guidance for estimating costs, the fully funded (escalated for inflation through project completion) cost estimate and the Total Project Cost Summary, including the risk analysis, is provided in **Appendix B**.

The TSP has undergone a higher level of engineering design than the other alternatives. This lessened the risk-based approach of using a 20% contingency during plan formulation to account for uncertainties.

Table 6-9 includes a breakdown of the estimated costs of the ecosystem elements for the authorized CEPP compared with estimated costs for the authorized CEPP, as modified by the PACR TSP. The cost of the authorized CEPP plan (escalated to 2018 price level) is $2,024,000,000. The total cost of the authorized CEPP plus the modifications resulting from the PACR TSP (at 2018 price level) is $3,164,000,000. The net increase in cost resulting from the PACR TSP is $1,140,000,000.

Estimated costs are broken down in **Table 6-9** by construction and non-construction costs for ecosystem restoration activities as well as the revised and updated costs, escalated to FY18 dollars. The total project cost includes costs for: Lands and Damages which generally include LERR (lands, easements, rights-of-way, and relocations); EDC (Engineering During Construction); PED (Preconstruction Engineering and Design); and S&A (Supervision and Administration) costs. Costs were estimated at Fiscal Year 2018 price levels and rounded to the nearest $1,000,000. The Federal discount rate of 2.75% and a 50-year economic period of analysis were used to amortize costs and determine the project investment costs.

Note that construction costs for several cost codes in **Table 6-9** are lower for the PACR TSP than the authorized CEPP plan. Construction costs for the A-2 FEB in the authorized CEPP plan were included in cost codes 09 (Channels and Canals), 11 (Levees), and 15 (Floodway Control and Diversion). As the A-2 Reservoir and A-2 STA would replace the A-2 FEB in the PACR TSP, estimated A-2 FEB construction costs were deleted from the corresponding cost codes in the PACR TSP column, and cost code 03 (Reservoirs) was added to the PACR TSP column to address construction costs associated with the proposed A-2 Reservoir.

Based on preliminary engineering and design of the TSP, the average annual cost of ecosystem restoration features is $143,104,000 (**Table 6-10**).

Table 6-9. Ecosystem Restoration Cost Estimates [1, 2, 3, 4, 5]

Construction Phase Items	CEPP (FWO) Costs (2014 Price Level)	Escalation %	CEPP (FWO) Costs (2018 Price Level)	CEPP PACR TSP Costs (2018 Price Level)
03 Reservoirs				$1,208,000,000
06 Fish and Wildlife (monitoring & adaptive management)	$106,000,000	7.71%	$114,000,000	$114,000,000
08 Roads, Railroads and Bridges				$15,000,000
09 Channels & Canals	$370,000,000	8.63%	$402,000,000	$325,000,000
11 Levees	$399,000,000	6.41%	$425,000,000	$314,000,000
13 Pumping Plant	$133,000,000	4.43%	$139,000,000	$251,000,000
15 Floodway Control and Diversion	$342,000,000	7.71%	$368,000,000	$339,000,000
18 Cultural Resources Preservation	$26,000,000	4.43%	$27,000,000	$27,000,000
32 HTRW Investigations	$1,000,000	5.96%	$1,000,000	$1,000,000
Construction Features Sub-Total	**$1,377,000,000**	**-**	**$1,476,000,000**	**$2,594,000,000**
Preconstruction Engineering and Design (PED), Engineering During Construction (EDC) and Planning	**$345,000,000**	**-**	**$366,000,000**	**$342,000,000**
Construction Management (S&A)	**$135,000,000**	**5.96%**	**$143,000,000**	**$167,000,000**
Lands & Damages	**$37,000,000**	**5.96%**	**$39,000,000**	**$61,000,000**
Total First Cost	**$1,894,000,000**	**-**	**$2,024,000,000**	**$3,164,000,000**

[1] Construction costs in this table include contingencies

[2] Recreation costs are not included in the ecosystem restoration cost estimates (see **Section 6.5**)

[3] Cost as authorized by Congress per ER 1105-2-100, Appendix G, Section G-16.a.(9). Note that this cost is the same as "project cost last submitted to Congress" as required by the regulation. No updated costs have been submitted to Congress since CEPP was authorized in December 2016 (per information provided by USACE, Jacksonville District).

[4] Cost updated to current price levels per ER 1105-2-100, Appendix G, Section G-16.a.(9)

[5] Cost of project being recommended (PACR TSP) per ER 1105-2-100, Appendix G, Section G-16.a.(9)

Table 6-10. Ecosystem Restoration Investment and Average Annual Costs

Investment	CEPP Costs (2014 Price Level)	CEPP Costs (2018 Price Level)	CEPP + PACR TSP Costs (2018 Price Level)
Total First Cost	**$1,894,000,000**	**$2,024,000,000**	**$3,164,000,000**
Interest During Construction: Construction	$96,000,000	$135,239,000	$211,410,000
Interest During Construction: Real Estate	$4,000,000	$2,657,000	$4,156,000
Total Investment Cost	**$1,994,000,000**	**$2,161,896,000**	**$3,379,566,000**
Average Annual Costs			
Interest and Amortization of Initial Investment	**$85,000,000**	**$90,066,000**[2]	**$125,182,000**
OMRR&R Sub Total	**$11,250,000**	**$11,920,000**	**$13,743,000**
New Project Features	$4,150,000	$4,397,000	$4,760,000
State Facilities	$4,000,000	$4,238,000	$5,629,000
Invasive Species	$3,100,000	$3,285,000	$3,354,000
Monitoring Sub-Total	**$3,880,000**	**$4,179,000**	**$4,179,000**
Water Quality	$710,000	$765,000	$765,000
Hydrometerological	$195,000	$210,000	$210,000
Ecological Sub-Total	$2,145,000	$2,310,000	$2,310,000
Biological Opinion	*$1,885,000*	*$2,030,000*	*$2,030,000*
General Ecological Monitoring[1]	*$260,000*	*$280,000*	*$280,000*
Adaptive Management[1]	$690,000	$743,000	$743,000
Invasive Species[1]	$140,000	$151,000	$151,000
Total Average Annual Costs 2	**$100,000,000**	**$106,165,000**	**$143,104,000**

[1] Costs reflect 10-year annual monitoring costs from Tables 6-9 and 6-10 amortized over the period of analysis
[2] FWO 2018 interest and amortization of initial investment cost has been escalated due to uncertainties in 2014 calculations

6.4.1 Real Estate

Fee title will be required for the project footprint of the A-2 Reservoir and A-2 STA. The estimated real estate cost for the A-2 parcel and A-2 Expansion area utilizing the actual acquisition costs are $60,882,368. Approximately $33,749,663 will be credited to the Federal Government and $27,132,705 will be credited to SFWMD which includes lands owned by the State of Florida valued at $12,628,700.

6.4.2 Operations, Maintenance, Repair, Replacement and Rehabilitation for Project Features

OMRR&R begins after physical project construction and Operational Testing and Monitoring is complete, and generally includes all operation activities and maintenance needed to keep the project features functioning as intended. OMRR&R for the CEPP project, as modified by the TSP, would occur for all new facilities constructed as a result of the project, and as an increase to the OMRR&R for State Facilities that CEPP, as modified by the TSP, would use to provide new water to the WCAs and ENP.

6.4.2.1 Average Annual Operations, Maintenance, Repair, Replacement, and Rehabilitation for New Project Features

The Operations and Maintenance Costs Methodology Report Database developed by SFWMD was used to calculate OMRR&R costs. This tool is useful in calculating basic operations, maintenance, and repair costs and is based on historical accruals for similar operations, maintenance and repair activities. Rehabilitation and replacement costs include those costs required to keep the pump station operable for the period of analysis. Repair and rehabilitation costs on items such as pumps, drivers, and switchgear are assumed to be rehabilitated or replaced once during the 50-year life cycle. While rehabilitation costs are typically only 35-45% of replacement costs; in order to provide a conservative estimate for the TSP and for CEPP, as modified by the TSP, major equipment replacement is considered in the estimate. Replacement is estimated to occur 30 years after placing the station into operation. The replacement cost includes engineering and structural modification costs as well as the equipment costs. **Table 6-11** lists the average annual OMRR&R costs for the TSP and for the overall CEPP, as modified by the TSP. The TSP will modify the CEPP New Water Component (A-2 FEB) by replacing it with a water storage reservoir and STA. The A-2 FEB OMRR&R is deducted to present an incremental project increase of the EAA Storage Reservoir and Treatment Wetlands. See **Appendix A** for a list of OMRR&R activities.

Table 6-11. Average Annual OMRR&R costs for New Project Features for CEPP and for CEPP with PACR TSP

Structure	CEPP (FWO) OMRR&R Costs 2014 Price Level	CEPP (FWO) OMRR&R Costs 2018 Price Level	CEPP + PACR TSP OMRR&R Costs 2018 Price Level
A-2 FEB	$2,090,000	$2,215,000	NA
A-2 Reservoir (new)	NA	NA	$1,932,000
A-2 Stormwater Treatment Area (new)	NA	NA	$2,829,000
S-620 (CS-1) 500 cfs gated culvert, S-621 (CS-2) 2,500 cfs gated spillway, S-622 (CS-3) 500 cfs gated spillway	$330,000	$350,000	$350,000
Modified S-8 (2 gated culverts)	$230,000	$244,000	$244,000
S-630 (360 cfs Pump Station)	$240,000	$254,000	$254,000
New S-333N - 1,150 cfs	$160,000	$170,000	$170,000
New (S-356) Pump Station at 1,000 cfs	$600,000	$636,000	$636,000
500 cfs gated culverts (S-631, S-632, and S-633)	$340,000	$360,000	$360,000
8.5 mile levee in WCA 3B	$50,000	$53,000	$53,000
S-355W-1,230 cfs gated spillway	$110,000	$117,000	$117,000
TOTAL Average Annual OMRR&R Costs New Facilities	**$4,150,000**	**$4,399,000**	**$6,945,000**

6.4.2.2 Average Annual Operations, Maintenance, Repair, Replacement and Rehabilitation for State Facilities used by CEPP, as modified by the TSP

The future OMRR&R costs of operating the State facilities, without CEPP or proposed modifications to CEPP contained in the TSP, are based on the Operations and Maintenance Costs Methodology Report Database developed by SFWMD, for CEPP. These costs have been escalated from FY14 to FY18 dollars for this CEPP PACR. The future OMRR&R costs of operating the system for the TSP are based on the volume of new water flowing through the State facilities as a portion of the overall water budget. The basis for this approach to allocating OMRR&R costs for State facilities that are used to support operations is presented in more detail in **Section 6.6.2**. In order to calculate the average annual OMRR&R costs attributed to the use of State facilities by CEPP, as modified by the TSP, a series of steps were taken to determine the new average annual OMRR&R costs of operating the State-owned facilities and associated infrastructure.

It should be noted that the same methodology used in the CEPP PIR for estimating the change in OMRR&R costs for State owned facilities based on the percent change in flows was used for this PACR. However, certain adjustments to the methodology were required to account for differences in the water budget, facilities and project operations used in the CEPP PACR planning effort. Treatment of the increased flow provided by the TSP requires use of the new A-2 STA facility, in addition to the existing STA-2 and STA-3/4, which creates a shift in the proportion and routing of flows into the existing STAs. These changes were accounted for in the TSP calculations of State owned OMRR&R costs by accounting for flow allocations to each facility when estimating the increase in flows each facility would receive.

<u>Step 1: Calculation of CEPP PACR's total flow through State Facilities</u>

The RSM-BN model run was performed to quantify total STA outflows as well as the proportion of flows to each STA for the ECB, FWO, and TSP. The TSP would increase flows above those identified in CEPP and provide a significant increase in the quantity of water flowing to the central Everglades and associated State-owned facilities. Since the CEPP PACR hydrologic modeling encompasses a 41-year period of record consisting of a wide range of hydrologic conditions, it is recommended that cost sharing for OMRR&R be based upon the average annual treatment capacity water budgets for the ECB and TSP conditions. The total average annual treatment capacity water budget of the State-owned/State-operated features, as identified from the RSM-BN EARECB, is approximately 760,300 ac-ft per year. An additional approximately 370,000 ac-ft per year was identified in the TSP model run, bringing the total capacity water budget of the State owned/State-operated features for the TSP project condition to approximately 1,130,300 ac-ft per year. Under the TSP, a new treatment facility, the A-2 STA, will receive a portion of the new water (from both the CEPP and the TSP) and as such, flows to the State-owned/State-operated facilities need to be adjusted accordingly. OMRR&R costs for treatment and conveyance of the new water made available from both CEPP and CEPP PACR (a total of approximately 370,000 ac-ft on an annual average basis) is proportioned in a similar method as done for the CEPP PIR and described herein.

<u>Step 2: Calculate the proportion of new Water (CEPP + TSP) to State facilities used by CEPP, as modified by the TSP</u>

Average annual OMRR&R costs with the TSP are commensurate with the increase in flows associated with the TSP's features. Based on RSM-BN model runs for the TSP, the approximately 370,000 ac-ft annual average total new water (CEPP + TSP) being treated by the A-2 STA is 162,100 ac-ft annual average and the remaining 207,900 ac-ft would be treated using existing State owned and -operated STA 2 and STA 3/4 facilities on an annual average basis (for more details, see **Section 3.2.1.3**). The treatment facilities that the water is being routed through will affect those facilities by a proportional increase in OMRR&R costs.

The 207,900 ac-ft average annual flow expected to be treated by State owned facilities results in an increase of approximately 27.3% (see **Equation 1** below) in flow to those facilities. The total average annual OMRR&R cost for State owned facilities receiving these additional flows will be increased by 27.3% over the costs identified in the EARECB condition costs. The State-owned facilities receiving these flows are the same as those identified in the CEPP PIR and listed in **Table 6-12** below.

Equation 1. This equation calculates percent flow increase across all State-owned Facilities to STA 3/4 and 2 as identified in **Table 6-8**.

$$\% \, Increase \; in \; Flow \; STA \; 3/4 \; \& \; 2 \; = \left(\frac{TSP \; Flow \; to \; State \; Facilities}{EARECB \; Flow \; to \; State \; Facilities} \right)$$
$$= \left(\frac{207{,}900 \; ac \; ft}{760{,}300 \; ac \; ft} \right) = 27.3\%$$

For the 162,100 ac-ft average annual flow expected to be treated by the new A-2 STA, only a portion of the facilities identified in the CEPP PIR (and listed in **Table 6-12**) will receive these flows. For those facilities that are directly associated with directing inflow to, or outflow from, the new A-2 STA, an increase of approximately 21.3% (see **Equation 2** below) in addition to the 27.3% increase from flows treated by State owned facilities, or a combined 48.6% increase of flows would be expected. The total average annual OMRR&R cost will be increased by 48.6% for those facilities receiving the additional flow produced from both the TSP and CEPP.

Equation 2. This calculates the additional percent increase above that noted in Equation 1 for those State owned facilities directly receiving inflow or outflow from the A-2 STA (a subset of facilities in **Table 6-12**).

$$\% \, Increase \; in \; Flow \; to \; A2 \; STA \; = \left(\frac{A2 \; STA \; Flow}{EARECB \; Flow \; to \; State \; Facilities} \right) = \left(\frac{162{,}100 \; ac \; ft}{760{,}300 \; ac \; ft} \right)$$
$$= 21.3\%$$

Step 3: Allocate the TSP's flow proportion to total OMRR&R costs of the State facilities used

Table 6-12 lists all the major structures that were evaluated for OMRR&R cost impacts in the CEPP PIR. Also included in **Table 6-12** are the average annual OMRR&R costs prior to CEPP and with CEPP (FWO) adjusted to FY18 dollars. An escalation rate of 5.96% was applied to OMRR&R FY14 costs identified in the CEPP PIR to bring them to FY18 dollars. To assess the OMRR&R costs for the TSP these same structures were re-evaluated based on the additional percent increase in flow anticipated at each structure. As noted in Step 2 above, it is anticipated that all facilities impacted by CEPP will see increased flows of 27.3% and, consistent with the analysis performed for the CEPP PIR, OMRR&R costs for all of these facilities are estimated to increase by 27.3%. In addition, facilities directly associated with inflow or outflow to the new CEPP PACR A-2 STA is estimated to receive an additional 21.3% increase in flow (a 48.6% total increase from CEPP plus CEPP PACR flows) and a corresponding increase in OMRR&R costs. These increased costs are applied to the OMRR&R costs without CEPP that were estimated in the CEPP PIR but adjusted to FY18 dollars. Federal cost share for these increased OMRR&R costs is 50% of the increase or 13.65% for flows to STA 3/4 and STA 2 and 24.3% for flows to the A-2 STA.

Table 6-12. Average Annual OMRR&R Costs of State Facilities used by CEPP, as Modified by the TSP

Structure	% Increase in Flow from CEPP PACR	Without CEPP Per Year Costs (FY18)	CEPP (FWO) Annual OMRR&R Cost (2018 Price Level)	CEPP + PACR TSP Annual OMRR&R Cost (2018 Price Level)
Current G-404 PS costs	48.6%	$360,000	$434,000	$535,000
STA 2 and Associated Infrastructure[1]	27.3%	$3,189,000	$3,942,000	$4,061,000
STA 3/4 and Associated Infrastructure[1]	27.3%	$3,899,000	$4,821,000	$4,965,000
FEB A-1 and Associated Infrastructure	27.3%	$1,960,000	$2,426,000	$2,496,000
G-357 Gated Culvert	48.6%	$117,000	$148,000	$174,000

Table 6-12. Average Annual OMRR&R Costs of State Facilities used by CEPP, as Modified by the TSP (continued)

Structure	% Increase in Flow from CEPP PACR	Without CEPP Per Year Costs (FY18)	CEPP (FWO) Annual OMRR&R Cost (2018 Price Level)	CEPP + PACR TSP Annual OMRR&R Cost (2018 Price Level)
G-370 PS	27.3%	$1,568,000	$1,928,000	$1,997,000
G-371 Gated Spillway	27.3%	$117,000	$148,000	$149,000
G-372 PS	48.6%	$1,960,000	$2,416,000	$2,914,000
G-434 PS	27.3%	$646,000	$805,000	$823,000
G-435 PS	27.3%	$318,000	$392,000	$405,000
S-6 PS	27.3%	$1,568,000	$1,928,000	$1,997,000
S-7 PS	27.3%	$1,346,000	$1,664,000	$1,714,000
S-8 PS	48.6%	$858,000	$1,060,000	$1,276,000
S-150 Gated Culverts	27.3%	$106,000	$138,000	$135,000
TOTAL Average Annual OMRR&R Costs State owned Facilities		**$18,012,000**	**$22,252,000**	**$23,641,000**

[1] See **CEPP PIR Appendix A Table A-35 and Table A-36** for a list of the STA structures. STA associated infrastructure will be identified prior to executing the Project Partnership Agreement for New Water.

<u>Step 4: Calculate the Incremental OMRR&R Costs due to the CEPP PACR:</u>

The equations above were used to calculate the costs shown in **Table 6-12**. The anticipated OMRR&R costs of State owned facilities receiving additional flow from the TSP is $5,629,000 (CEPP PACR OMRR&R $23,641,000 minus the Without CEPP OMRR&R $18,012,000). The USACE's pro-rated share for OMRR&R for the aforementioned State facilities used by the TSP is 50% of the $5,629,000 or $2,814,500 of the total OMRR&R costs. This cost share will apply to the State facilities and the C&SF features listed above to the extent that OMRR&R activities are directly related to their use for treating "new water."

The incremental cost to State owned facilities, based on estimates shown in **Table 6-12,** show a net increase of $1,389,000 per year compared to the FWO (CEPP PACR TSP $23,641,000 minus CEPP (FWO) $22,252,000). OMRR&R costs for the A-2 Reservoir and A-2 STA is calculated separately in **Section 6.4.2.1**.

6.4.3 Invasive Species Management

The CEPP PACR TSP is not expected to measurably affect the estimate of costs for invasive species management that was developed for CEPP. Therefore, the costs presented below are the same as those presented in the CEPP PIR, with price level escalation to FY18 included as appropriate. Invasive species management costs accrue during all phases of the project, as shown in **Table 6-13** below. Pre-construction management activities, construction phase activities, and Operational Testing and Monitoring Period (OTMP) activities are all construction based activities and are included in the Fish and Wildlife account of the Total Project Cost Summary. As can be seen in **Table 6-13**, some post-construction monitoring and management will occur during 10-year cycles and some management activities for invasive species including surveillance, control, etc., will occur throughout the OMRR&R phase.

Table 6-13. Summary of Cost Estimates for Invasive Species Management

Invasive Species Management Costs	CEPP (FWO) (2014 Price Level)[1]	CEPP (FWO) (2018 Price Level)	CEPP + PACR TSP (2018 Price Level)
	Construction Costs		
Pre-Construction Management and Monitoring	$1,220,000	$1,314,000	$1,314,000
Construction Phase Management	$5,720,000	$6,161,000	$6,161,000
Operational Testing and Monitoring Period (OTMP)			
Management	$4,430,000	$4,772,000	$4,772,000
Monitoring	$570,000	$614,000	$614,000
Sub Total OTMP	**$5,000,000**	**$5,386,000**	**$5,386,000**
Total Invasive Species Management During Construction	**$11,940,000**	**$12,861,000**	**$12,861,000**
	Post-Construction Costs		
Post Construction Monitoring Costs – cost per year for a 10-year cycle	**$400,000**	**$431,000**	**$431,000**
Post Construction Management Costs – average annual cost	**$3,100,000**	**$3,339,000**	**$3,339,000**

[1] Construction costs include the CEPP project contingency of 44%.

6.4.4 Monitoring and Adaptive Management

The methods, locations, timing, and funding requirements for conducting AM and monitoring are included in **Annex D**. The cost of the AM and Monitoring Plans for the CEPP PACR TSP is expected to be essentially the same as the AM and Monitoring Plans for the authorized CEPP plan. It is recognized that some slight adjustments in temporal or spatial extent and the overall timing of the individual monitoring components might need to be adapted much like many CERP projects due to the lag between the writing of the PIR, authorization of the project, and construction and operation of the project. The CEPP monitoring and AM plan was designed to provide the monitoring required to address CEPP-specific needs while being integrated with other Everglades monitoring to take advantage of existing monitoring efforts, knowledge, and information. The CEPP AM and Monitoring Plans leverage several existing programs to avoid redundancies and insure cost-effectiveness. Since CEPP relies on existing physical instrumentation, stations, locations, servicing, and analysis efforts funded by RECOVER, CERP sponsors, and partner agencies, the monitoring requirements described in the CEPP plan are limited to the additional increase in monitoring resources and analysis efforts needed to address CEPP-specific questions. The CEPP monitoring plan, including minor adjustments to account for the TSP assumes these other monitoring efforts will continue at least for the period required by CEPP. AM and monitoring costs accrue during different phases of the project, as shown in **Table 6-14** below. Construction for AM options, pre-construction data investigation, construction phase monitoring, and OTMP are all construction-based activities and are included in the Fish and Wildlife line of **Table 6-9**. Post-construction monitoring of CEPP success at meeting ecological objectives and to inform adaptive management will occur during 10-year windows that are staggered to coincide with CEPP PACR's construction schedule (**Annex D**, **Part 1, Figure D.1.10**). Monitoring such as hydrometeorological monitoring that informs project operations may continue longer than 10 years. **Table 6-14** provides a conservative estimate of annual costs for monitoring that may continue as necessary and required during OMRR&R. A conservative estimate for potential water quality monitoring has been included. It is anticipated that the monitoring requirements will be assessed periodically and revised as needed.

The USFWS Programmatic Biological Opinion (BO) for the authorized CEPP plan stated that further consultation would be needed when more specific project details are finalized during PED. The need for further consultation remains applicable to the authorized CEPP plan, as modified by the TSP as presented herein. This CEPP PACR includes a Biological Assessment of effects on threatened and endangered species in **Annex A**, basing anticipated effects on listed species, including three endangered avian species (CSSS, snail kite, and wood stork), on the best available current information. USACE will initiate formal consultation for the TSP following submittal of the CEPP PACR to the ASA(CW). Upon completing ESA Section 7 consultation for each PPA, USACE will undertake the agreed-to avoidance and minimization measures and implementing the terms and conditions (TCs). When USACE is closer to constructing phases of CEPP that will affect listed species, USFWS will provide separate consultation document(s) which may authorize incidental take, and provide applicable reasonable and prudent measures (RPMs) and TCs. Although the Programmatic BO does not specify RPMs and TCs for the three avian species, endangered species monitoring costs include a conservative estimate of potential required monitoring based on information provided by USFWS to ensure the costs were captured. Estimated endangered species monitoring costs are $3,351,000 pre-construction, $37,830,000 during the construction period and the O&M cost will be approximately $2,030,000 annually. It is anticipated that the monitoring requirements will be assessed periodically and revised as needed.

Table 6-14. Summary of Cost Estimates for Monitoring and Adaptive Management

	CEPP (FWO) 2014 Price Level	**CEPP (FWO) 2018 Price Level**	**CEPP + PACR TSP 2018 Price Level**
	Construction Costs – Construction General Funding[1]		
Adaptive Management Options	$23,500,000	$25,312,000	$25,312,000
Pre-construction Data Investigation (PED) - Adaptive Management	$40,000	$43,000	$43,000
Pre-construction USFWS CEPP BO Ecological Monitoring	$3,111,000	$3,351,000	$3,351,000
Construction Phase Monitoring			
Adaptive Management	$7,010,000	$7,550,000	$7,550,000
Water Quality	$20,000	$22,000	$22,000
Ecological	$1,200,000	$1,293,000	$1,293,000
USFWS BO Ecological Monitoring	$35,122,000	$37,830,000	$37,830,000
Sub-Total Construction Phase Monitoring	$43,352,000	$46,695,000	$46,695,000
Operational Testing and Monitoring Period (OTMP)			
Water Quality Monitoring	$710,000	$765,000	$765,000
Hydrometeorological Monitoring	$2,490,000	$2,682,000	$2,682,000
USFWS BO Ecological Monitoring	$1,885,000	$2,030,000	$2,030,000
Sub-Total OTMP Monitoring	$5,085,000	$5,477,000	$5,477,000
Total Monitoring And Adaptive Management First Cost (rounded)	**$75,088,000**	**$80,878,000**	**$80,878,000**

Table 6-14. Summary of Cost Estimates for Monitoring and Adaptive Management (continued)

	Post Construction Costs – Operations and Maintenance Funding		
Post Construction Monitoring Costs – cost per year for a 10 year cycle			
General Ecological Monitoring	$740,000	$797,000	$797,000
Adaptive Management	$1,950,000	$2,100,000	$2,100,000
Sub-total Post Construction Monitoring ($ annually over 10 years)	**$2,690,000**	**$2,897,000**	**$2,897,000**
Post Construction Monitoring Costs – average annual cost			
Hydrometeorological	$195,000	$210,000	$210,000
Water Quality	$710,000	$765,000	$765,000
USFWS BO Ecological Monitoring	$1,885,000	$2,030,000	$2,030,000
Sub-total Post Construction OMRR&R ($ average annual)	**$2,790,000**	**$3,005,000**	**$3,005,000**

[1] Costs in this table are rounded and include the project contingency of 44%

6.4.5 Operational Testing and Monitoring Period Costs

The CEPP PACR TSP, as presented herein, is expected to affect the estimate of costs for operational testing and monitoring that was developed for CEPP. As defined in the CERP Master Agreement, the term "Operational Testing and Monitoring Period" (OTMP) shall mean a reasonable, limited period of time within the period of construction, after physical construction has been completed, during which the authorized CERP Project or a functional portion of the authorized CERP Project is operated, tested and monitored to verify that the constructed features operate as designed, and to allow for any adjustments to such features as may be necessary so that such features perform as designed.

The OTMP costs for authorized CEPP project features plus the TSP are included in the PED/EDC construction costs in **Table 6-11** and accrue for interim operation of project features during OTMP. The total amount for interim operations and testing during the OTMP is equivalent to one year of OMRR&R for new CEPP PACR project features (A-2 Reservoir and A-2 STA) at approximately $4,760,000. The incremental increase of the TSP over the authorized CEPP A-2 FEB is approximately $2,795,000.

The invasive species management and monitoring costs during OTMP of approximately $5,386,000 (**Table 6-13**) and project monitoring during OTMP of approximately $5,477,000 (**Table 6-12**) are included in the Fish and Wildlife line in **Table 6-9**.

6.4.6 Cultural Resources Preservation Costs

The CEPP PACR TSP, as presented herein, is not expected to measurably change the estimate of cultural resource preservation costs that were developed for CEPP. Therefore, the costs presented below are the same as those presented in the CEPP PIR, with price level escalation included as appropriate. The identification, evaluation and mitigation of cultural resources are included in **Table 6-15**. Data Recovery is 100% Federal responsibility until the cost of Data Recovery reaches 1% of the total project cost. Afterwards, anything above the 1% cap will be cost shared 50/50 between the Federal Government and the non-Federal sponsor. Data Recovery caps are identified in ER 1105-2-100 Appendix C-4.d(6)(d) and the Archaeological and Historic Preservation Act Section 7. Costs in **Table 6-15** for mitigation are included in the Cultural Resources Preservation line item in **Table 6-9**, and the PED costs are included within the PED line item in **Table 6-9**.

Table 6-15. Cultural Resources Cost Breakdown

Item	CEPP (FWO) 2014 Price Level	CEPP + PACR TSP 2018 Price Level
Mitigation	$25,740,000	$26,880,000
Data Recovery[1]	$1,750,000	$1,828,000
PED	$3,050,000	$3,185,000
Cultural Resources Cost Total[2]	$29,000,000[3]	$30,285,000

[1] Data Recovery is 0.1% of the total CEPP PACR cost.
[2] Cultural resources cost total includes contingency
[3] Cultural resources costs include PED. Cultural resources line in Table 6-9 only includes mitigation and data recovery; total is rounded

6.5 COST ESTIMATE FOR RECREATION ELEMENTS

The CEPP PACR TSP is expected to slightly increase the average annual cost of recreation facilities that were developed for CEPP, as indicated in **Table 6-16** below. Recreation elements of the TSP include sufficient gravel parking with boat ramps and trailheads, dry vault toilets, shelters, primitive camping sites and Americans with Disabilities Act–compliant fishing platforms as described in **Section 6.1.6** and **Appendix F**. The new capital cost for the CEPP PACR recreational plan is $10,153,000 (includes the CEPP PIR contingency of 44%) including all features in the authorized CEPP. The expenditures attributed to recreation features are justified using a benefit to cost ratio. The tangible economic justification of the proposed project can be determined by comparing the equivalent average annual costs with the estimate of the equivalent average annual benefits realized over the period of analysis. The average annual recreation benefits and costs are summarized in **Table 6-16**. The Federally mandated project evaluation interest rate of 2.75%, an economic period of analysis of 50 years and 2018 price levels were used to evaluate economic feasibility. The benefit to cost ratio for the recreation features for the CEPP PACR TSP is 2.77 to 1, with net annual benefits of $776,700.

Table 6-16. Summary of Recreation Costs and Benefits

Item	CEPP (FWO) 2014 Price Level	CEPP (FWO) 2018 Price Level	CEPP + PACR TSP 2018 Price Level
Total Recreation Construction Cost	$6,400,000	$6,669,000	$9,756,000
Interest During Construction	$330,000	$271,000	$396,500
Total Investment	**$6,730,000**	**$6,940,000**	**$10,153,000**
Amortized	$287,000	$257,100	$376,500
OMRR&R	$68,000	$61,700	$61,700
Average Annual Cost	**$355,000**	**$318,800**	**$437,800**
Unit Day Value[1]	$7.79	$8.20	$9.29
Daily Use	200 users	200 users	358 users
Annual Use (200 users x 365 days)	73,000	73,000	130,670
Average Annual Benefit	**$570,000**	**$598,700**	**$1,214,400**
Benefit to Cost	**1.6 to 1**	**1.88 to 1**	**2.77 to 1**
Net Annual Benefits	**$215,000**	**$280,000**	**$776,700**

[1] Unit Day Values reflect FY18 guidance (EGM 18-03, Unit Day Values for Recreation)

6.6 COST SHARING

CEPP costs, including the value of LERR and PED costs, as they would be shared between the Federal Government and the non-Federal sponsor per the CEPP PIR (2014), are presented in **Table 6-17**. The non-Federal sponsor would provide cash, perform work-in-kind during PED or construction, as necessary, to meet its 50% share of the total first cost of the project to be balanced according to Section 601(e) of WRDA 2000. The Federal/non-Federal cost share for the authorized CEPP plan, escalated to the 2018 level, is presented in **Table 6-18**.

Table 6-17. Cost Share for the Authorized CEPP Plan (2014 Price Level)

Item	Federal Cost	Non-Federal Cost	Total[1]
Ecosystem Restoration			
Restoration Construction	$676,875,000	$700,125,000	$1,377,000,000
PED[1]	$172,500,000	$172,500,000	$345,000,000
Construction Management	$67,500,000	$67,500,000	$135,000,000
LERR	$31,000,000	$6,000,000	$37,000,000
Ecosystem Restoration Subtotal	**$947,875,000**	**$946,125,000**	**$1,894,000,000**
Recreation (NED)			
Recreation Subtotal	**$3,000,000**	**$3,000,000**	**$6,000,000**
Total Project First Cost[2]	**$950,875,000**	**$949,125,000**	**$1,900,000,000**
Average Annual Costs			
OMRR&R - CEPP Features	$2,075,000	$2,075,000	$4,150,000
OMRR&R - State Facilities	$2,000,000	$2,000,000	$4,000,000
OMRR&R - Invasive Species	$1,550,000	$1,550,000	$3,100,000
OMRR&R - Monitoring (cost per year over 10- year cycle)[3]	$1,345,000	$1,345,000	$2,690,000
OMRR&R - Monitoring (annual cost)	$1,395,000	$1,395,000	$2,790,000
OMRR&R - Recreation		$65,000	$65,000

[1] Construction costs totals are FY '14 First Costs Rounded to the nearest $1,000,000.
[2] Federal costs include cultural resources data recovery of $1,750,000 represented at 100% Federal responsibility.
[3] 10-year monitoring costs are included in **Table 6-12**, and are amortized over the period of analysis in **Table 6-8.**

Table 6-18. Cost Share for the Authorized CEPP Plan (escalated to 2018 Price Level)

Item	Federal Cost	Non-Federal Cost	Total[1]
Ecosystem Restoration			
Restoration Construction	$725,915,000	$749,085,000	$1,476,000,000
PED[1]	$183,000,000	$183,000,000	$366,000,000
Construction Management	$71,500,000	$71,500,000	$143,000,000
LER&R	$32,000,000	$7,000,000	$39,000,000
Ecosystem Restoration Subtotal	**$1,012,915,000**	**$1,011,085,000**	**$2,024,000,000**
Recreation (NED)			
Recreation Subtotal	$3,500,000	$3,500,000	$7,000,000
Total Project First Cost[2]	**$1,016,415,000**	**$1,014,585,000**	**$2,031,000,000**

Table 6-18. Cost Share for the Authorized CEPP Plan (escalated to 2018 Price Level) (continued)

Item	Federal Cost	Non-Federal Cost	Total[1]
Average Annual Costs			
OMRR&R - CEPP Features	$2,198,500	$2,198,500	$4,397,000
OMRR&R - State Facilities	$2,119,000	$2,119,000	$4,238,000
OMRR&R - Invasive Species	$1,642,500	$1,642,500	$3,285,000
OMRR&R - Monitoring (cost per year over 10- year cycle)	$1,448,500	$1,448,500	$2,897,000
OMRR&R - Monitoring (annual cost)	$1,669,500	$1,669,500	$3,339,000
OMRR&R - Recreation		$68,000	$68,000

[1] Construction costs totals are FY '18 First Costs. The Ecosystem Restoration costs are rounded to the nearest $1,000,000.
[2] Federal costs include cultural resources data recovery of $1,830,000 represented at 100% Federal responsibility.
[3] 10-year monitoring costs are included in **Table 6-10**, and are amortized over the period of analysis in **Table 6-6**.

In **Tables 6-18 and 6-19,** non-Federal costs have been updated to include funds appropriated by SFWMD as local sponsor for three projects.

The Federal/non-Federal cost share for the TSP for the proposed post-authorization change for the authorized CEPP plan is presented in **Table 6-19**.

Table 6-19. Cost Share for the TSP for Proposed Modification to the Authorized CEPP Plan (2018 Price Level)

Item	Federal Cost	Non-Federal Cost	Total[1]
Ecosystem Restoration			
Restoration Construction	$1,294,415,000	$1,299,585,000	$2,594,000,000
PED[1]	$171,000,000	$171,000,000	$342,000,000
Construction Management	$83,500	$83,500	$167,000,000
LER&R	$34,000,000	$27,000,000	$61,000,000
Ecosystem Restoration Subtotal	**$1,582,915,000**	**$1,581,085,000**	**$3,164,000,000**
Recreation (NED)			
Recreation Subtotal	$5,000,000	$5,000,000	$10,000,000
Total Project First Cost[2]	**$1,587,915,000**	**$1,586,085,000**	**$3,174,000,000**
Average Annual Costs			
OMRR&R - CEPP Features	$2,380,000	$2,380,000	$4,760,000
OMRR&R - State Facilities	$2,814,500	$2,814,500	$5,629,000
OMRR&R - Invasive Species	$1,677,000	$1,677,000	$3,354,000
OMRR&R - Monitoring (cost per year over 10-year cycle)	$1,448,500	$1,448,500	$2,987,000
OMRR&R - Monitoring (annual cost)	$1,669,500	$1,669,500	$3,339,000
OMRR&R - Recreation		$68,000	$68,000

[1] Construction costs totals are FY '18 First Costs. The Ecosystem Restoration costs are rounded to the nearest $1,000,000.
[2] Federal costs include cultural resources data recovery of $1,830,000 represented at 100% Federal responsibility.
[3] 10-year monitoring costs are included in **Table 6-10,** and are amortized over the period of analysis in **Table 6-6**

6.6.1 Cost Sharing of Real Estate

Total estimated real estate costs for the authorized CEPP plan (at 2018 price levels) were $60,000,000 (rounded), of which approximately $34,000,000 (rounded) are creditable to the Federal Government and approximately $27,000,000 (rounded) are creditable to the SFWMD. Federal funds contributed by DOI pursuant to Section 390 of the Federal Agriculture Improvement and Reform Act of 1996 (P.L. 104-127, 110 Stat. 1022) are credited to the Federal share of the project cost pursuant to Section 601 (e)(3) of the WRDA of 2000. DOI contributed approximately $33,749,663 toward the purchase of the A-2 parcel and A-2 Expansion area. SFWMD contributed approximately $9,402,005 toward the purchase of land in the A-2 parcel and A-2 Expansion area. Those lands owned by the State of Florida in the A-2 Expansion area are currently valued at $12,628,700. The remaining private lands in the A-2 Expansion area are expected to be acquired from willing sellers. SFWMD will receive credit for the fair market value of lands in accordance with the terms of the CERP Master Agreement. More details are provided in **Appendix D**.

6.6.2 Cost Sharing of Operations, Maintenance, Repair, Replacement, and Rehabilitation of State owned Facilities

Consistent with the provisions of Section 601(e)(4) of the WRDA of 2000, the OMRR&R associated with the ecosystem restoration features of the authorized CEPP plan to be shared equally between the Federal Government and the non-Federal sponsor. The Federal and non-Federal sponsor's obligations to provide OMRR&R will continue indefinitely unless the project is de-authorized by Congress. OMRR&R costs associated with recreation features of the plan will be funded 100% by the non-Federal sponsor.

The authorized CEPP plan requires the use of several State facilities constructed and operated pursuant to State permits. The facilities are necessary for the State to meet CWA requirements as approved by the USEPA, and as litigated by the U.S. Department of Justice. Some of these requirements are currently subjected to a Settlement Agreement filed with and overseen by the Federal District Court (*United States v. South Florida Water Management District*, Case No. 88-1886-CIV-Moreno (S.D. Fla. 1988)).

The non-Federal sponsor is responsible for the operation, maintenance, repair, replacement, and rehabilitation of all State features, including the State Restoration Strategies and Everglades Construction Project facilities. Certain of those facilities, as named below and herein after referred to as "State facilities", are to be used by CEPP, as authorized, until such time as CEPP is deauthorized or it is determined use of the State facilities are no longer necessary for the purpose of achieving CEPP project purposes. The modifications to the CEPP plan, as proposed by the TSP addressed herein, would continue to require the use of State facilities to meet CWA requirements. The State's A-1 FEB operations will be integrated with the proposed A-2 Reservoir and A-2 STA and operated pursuant to a mutually agreed upon water control manual. The joint water control plan for the project will integrate the operation of CEPP, proposed modifications to CEPP addressed herein, and the operation of the State facilities. The State facilities will use excess capacity to process "new water" provided by CEPP, as modified by the TSP, in addition to the water processed for purposes of achieving the State's water quality requirements.

The 2016 CEPP authorization provided for cost sharing of the OMRR&R for the following State facilities necessary to process new water provided by CEPP and not previously cost shared for construction under the C&SF Project or other Federal authority and the listed C&SF features that are currently cost shared pursuant to executed resolutions: (1) STA 2, (2) STA 3/4, (3) A-1 FEB, (4) G-370 Pump Station, (5) G-371 Gated Spillway, (6) G-372 Pump Station, (7) G-357 Gated Culvert, (8) G-404 Pump Station, (9) G-434 Pump Station, (10) G-435 Pump Station, (11) S-6 Pump Station, (12) S-7 Pump Station, (13) S-8 Pump Station, and (14) S-150 Gated Culverts and their corresponding remote-control facilities. The TSP for proposed modifications to CEPP, as presented in this CEPP PACR, would not change the approach used to determine Federal cost sharing for OMRR&R of these State facilities. However, a change in the cost-share percentage is recommended based on the additional new water to be provided by the TSP and treated by these facilities.

The aforementioned State facilities will use available capacity to process "new water" provided by the TSP and these costs have been re-evaluated as described in **Section 6.3.8.2**. For the purposes of this report, OMRR&R costs are assumed to be linear with flow volumes and will therefore increase the OMRR&R costs for the State facilities proportional to the additional flows each facility will process. Therefore, consistent with the general CERP authorization for cost sharing of State owned OMRR&R facilities (WRDA 2000 Section 601(e)(4)), the TSP OMRR&R costs will be $5,629,000 annually, which includes the aforementioned facilities to the extent that OMRR&R activities are directly related to their use for treating "new water." The USACE's pro-rated share for OMRR&R for the aforementioned State facilities used by the TSP is 50% of the $5,629,000, or $2,814,500 of the total OMRR&R costs. This cost share will apply to the State facilities and the C&SF features listed above to the extent that OMRR&R activities are directly related to their use for treating "new water."

All other aspects of cost sharing of OMRR&R for use of State facilities by the authorized CEPP plan as described above would remain the same as those presented in the 2014 CEPP PIR (Section 6.6.2). These aspects include: (1) future adjustments to the cost sharing if future monitoring of the "new water" actually produced as a result of CEPP either falls short of or exceeds the projected amount (representing that which is reserved or allocated to the natural system); and (2) changes to the cost sharing that may result from modifications to the list of State facilities required to process the "new water." Even though the total amount of "new water" would be different between CEPP as currently authorized and CEPP plus the TSP, the process for addressing these considerations would be the same.

6.6.3 Cost Sharing of Monitoring

CERP post-construction project monitoring is cost-shared for a maximum period of 10-years for performance-based ecological monitoring, and monitoring required for operations may continue longer. The TSP would not appreciably change the overall plan for post-construction project monitoring under CEPP. See **Annex D Part 1, AM Plan** for information on the staggered implementation of 10-year monitoring windows. These efforts would be cost shared during the construction phase of the project in accordance with Section 601(b)(2) of WRDA 2000. After construction, the costs would become part of the project's OMRR&R plan and cost-shared as described in the recommendations section of this report.

System-wide monitoring will be performed as part of the CERP Monitoring Assessment Program implemented by RECOVER. Data collected as part of this monitoring program is critical to the overall success of CERP Projects. Funding for system-wide monitoring is provided through programmatic funding for RECOVER, and also relies on other agency funded monitoring when there is monitoring that makes sense for the program to leverage. This monitoring and its funding streams are independent from project-level funding. A DPOM (**Annex C**) has been developed for use in water management. Operational monitoring will be cost shared during the operation and maintenance phase of the Project.

6.6.4 Cost Sharing of Cultural Resources Preservation

Data recovery is 100% Federal responsibility until the cost of Data Recovery reaches 1% of the total project cost. Any Data Recovery costs above the 1% limit would be cost shared at 50% Federal-50% non-Federal. Data recovery caps are identified in ER 1105-2-100 Appendix C-4.d(6)(d) and the Archaeological and Historic Preservation Act Section 7.

6.6.5 Non-Federal Sponsor Work-In-Kind for Construction

Should the non-Federal sponsor construct phases of the CEPP, as authorized or as modified by the TSP, prior to execution of a PPA, then this work must be covered by a Pre-Partnership Credit Agreement (PPCA). The non-Federal sponsor would receive credit for such construction costs at the time the PPA for CEPP is executed. Such credit would be applied toward the non-Federal sponsor's share of the costs associated with the implementation of the CERP as authorized by Section 601(e)(5)(C) of WRDA 2000. Such credit shall not include cash reimbursements, and shall be subject to: a) the authorization of the CEPP project by law; b) a determination by the Secretary of the Army that the construction work completed under the PPCA is integral to the authorized CERP restoration project; c) a certification by the District Engineer that the costs are reasonable, allowable, necessary, auditable, and allocable; and d) a certification by the District Engineer that the activities have been implemented in accordance with USACE design and construction standards and applicable Federal and State laws. Also, per Section 601(e)(5)(E) of the WRDA of 2000, in-kind credit is subject to audit by the Secretary.

6.6.6 CEPP Funding Since Authorization

In accordance with Appendix G 1105-2-100 for PACR, **Table 6-20** includes the Federal funding history, by fiscal year, including the category in which funds have been appropriated since the CEPP PIR has been authorized (FY16). In FY 18-19 the USACE appropriated $1M to initiate the CEPP Limited Re-evaluation Report (LRR). The SFWMD as local sponsor moved forward with $5,000,000 of funding for removal of Old Tamiami Trail and $11.5 M for increasing capacity at S-333N, for a State funding total of $16.5M.

Table 6-20. Federal Funding Since Authorization

Category	Fiscal Year (FY)	Funding Amount	Description
N/A	FY 17-18	$0	N/A
PED	FY 18-19	$1,000,000	CEPP LRR

6.7 PLAN IMPLEMENTATION

Implementation of the CEPP plan, as modified by the TSP, will occur over many years, dictated by State and Federal appropriations. This subsection discusses the major implementation phases that are expected to occur after Congressional authorization and appropriation of funding for project construction. Multiple PPAs will be executed prior to construction. Each PPA will cover a separable element that groups inter-related project features to provide hydrologic and ecological benefits. These PPAs include the construction of logical groupings of plan elements that maximize early benefits to the extent practicable consistent with project dependencies (**Table 6-21**) and the CEPP AM and Monitoring Plans (see **Annex D**).

A multiple PPA approach incorporates the adaptive management process, per the guidance of the Programmatic Regulations for the CERP (2003) and the WRDA of 2007. Sequencing of the PPAs will allow earlier restoration benefits by initially building project components that take advantage of existing water in the system that meets State water quality standards, while providing assurances of sound financial investments.

6.7.1 Implementation and Construction Sequencing

6.7.1.1 Dependencies and Requirements

Upon identification of a TSP, the next step is to consider how features will be implemented (sequencing scenarios) when considering internal and external project dependencies. Development of sequencing for features considers that a number of CERP and non-CERP projects (**Table 6-21**) must be constructed and operating before implementing most features to avoid unintended consequences. Additionally, several basic principles considered in development of an implementation plan for features include the following:

1. All features of the State's Restoration Strategies must be completed and meet State water quality standards prior to initiating operations of most project features.
2. Construction of project features cannot proceed until it is determined that construction and operation of the feature:
    a. Will not cause or contribute to a violation of State water quality standards; and
    b. Will not cause or contribute to a violation of any applicable water quality permit discharge limits or specific permit conditions; and
    c. Reasonable assurances exist that demonstrate adverse impacts on flora and fauna in the area influenced by the Project features will not occur.
3. Appendix A water quality compliance must be addressed consistent with **Section 8.5** for new project water entering ENP.
4. The operation of State facilities is required to ensure that new water made available by the TSP, upon authorization, meets water quality standards and to ensure achievement of project benefits. If after construction and operation of project features State water quality standards are not being met, the Federal and State partners agree per **Section 8.5** of this report to meet to determine the most appropriate course of action in accordance with existing law and policy.
5. Sequencing takes into account the earliest opportunity to realize benefits, including the features that can provide benefits that utilize existing water meeting State water quality standards.
6. Additional outlet capacity from the south end of WCA 3A must be provided before new project water from Lake Okeechobee is released into WCA 2A and WCA 3A.
7. The sources of material needed for Miami Canal backfilling and the Blue Shanty Levee, under the CEPP authorized plan, were considered to minimize costs associated with double handling and stockpiling of materials.
8. Where possible sequencing should include steps and timing to test concepts, as described in the AM Plan (**Annex D**).
9. Recreation features will be constructed in conjunction with corresponding project plan features.

In the future, these CERP and non-CERP features will be built as described in **Table 2-2** of **Section 2**; however, the timing of their completion affects CEPP implementation. Specific project features cannot be operated until other CERP and non-CERP projects are constructed and operational. **Table 6-19** provides a complete list of which CEPP features are dependent on other projects and their operation in order to operate CEPP and obtain the full benefits envisioned, further detailed information is contained in **Section G.6** of **Appendix G**.

Table 6-21. Project Dependencies

Project	Feature Dependencies
A-1 FEB State Restoration Strategies	Required prior to implementation of northern WCA 3A distribution features (L-4 degrade, new pump station, S-8 Modifications, L-5 and L-6 improvements, Miami Canal Backfilling) to ensure adequate water quality treatment of inflows. Construction of the A-1 FEB was completed in 2015. Construction of the remainder of the Restoration Strategy projects are projected to be complete in 2025.
8.5 Square Mile Area and Existing S-356	Construction of the C-358 seepage collector canal and structure S-357N within the 8.5 SMA must be completed to allow full utilization of the 8.5 SMA features to provide seepage mitigation for increasing flows into Northeast Shark River Slough. Construction of these features is underway and anticipated to be complete in 2018. Operation of the existing S-356 pump station (500 cfs) is required prior to significantly increasing flows to NESRS, to provide seepage management. Construction of this project feature is complete. Operational testing began in 2015 in support of development of the required final integrated operational plan for the Modified Water Deliveries and C-111 South Dade project expected to be complete in 2020.
C-111 South Dade	Extension of the detention area levees to connect with 8.5 square mile area (SMA) required prior to significantly increasing flows to NESRS to enable operation of S-357 pump station up to full design capacity to provide seepage management to 8.5 SMA. Contract 8A construction projected to be complete in 2019. Final integrated operational plan for the Modified Water Deliveries and C-111 South Dade project is expected to be complete in 2019.
MWD 1-Mile Bridge & Road Raising	The MWD bridge and road raising is complete and operational, which is necessary to implement WCA 3B inflow structures along the L-67A&C levees or increasing flows through existing S-333 to NESRS to ensure adequate road protection to allow for increased stages in L-29 canal.
BCWPA C-11 Impoundment	Required prior to increasing flow through S-333, projected to be complete in 2020, or implementation of WCA 3B inflow structures along the L-67A&C levees to ensure adequate water quality of inflows to WCA 3B and NESRS. The Broward Water Preserve Area was authorized in WRRDA 2014. Construction of the C-11 Impoundment projected to be complete in 2025.
Tamiami Trail Next Steps Bridging and Road Raising	Required prior to increasing capacities of S-333 and S-356 and implementation of the two WCA 3B inflow structures along the L-67A levee to the flowway, gaps in L-67C levee and Blue Shanty flowway (L-67C removal, L-29 levee removal). Construction of the 2.6 mile western bridge has started and is projected to be complete in 2020.
C-44 Reservoir (IRL-S) and connection to C-23 Canal	Required prior to re-directing the maximum amount of water from Lake Okeechobee south to the A-2 Reservoir and STA to meet environmental performance, to avoid increases in low flow violations to the St. Lucie Estuary and to avoid low Lake Okeechobee water levels that effect the LOSA. Construction is underway and projected to be complete in 2020.
Modification of the Lake Okeechobee Regulation Schedule	Anticipated prior to full utilization of the TSP in order to achieve the complete ecological benefits envisioned through re-directing the full approximately 370,000 ac-ft per year south and to avoid low Lake levels that would affect the LOSA. The modification to the 2008 LORS which may be developed in response to system-wide operating plan updates to accommodate CERP projects (Section 2.5, Section 6.1.3.2) and/or sufficient HHD remediation and associated culvert improvements is anticipated in 2022, subject to outcome of the Dam Safety Modification Report.

In addition to the project feature dependency considerations listed in **Table 6-21**, other factors influencing implementation of the authorized CEPP features include funding availability and maintenance of the cost-share balance between the Federal and non-Federal sponsor. The USACE and the SFWMD will undertake integration of the authorized CEPP features, proposed CEPP modifications presented in this CEPP PACR, and the other CERP projects awaiting authorization.

6.7.1.2 Multiple Project Partnership Agreements

Authorized CEPP features were grouped into three separate PPAs based upon the spatial distribution of the features and the locations within the CEPP study area where separable hydrologic and environmental benefits would accrue as described below. These groupings include a PPA to cover project features in northern WCA 3A (PPA North), a PPA to cover project features in southern WCA 3A, 3B and ENP (PPA South), and a PPA to cover the new water storage, treatment and required seepage management features (PPA New Water). The CEPP PACR is only proposing changes to the original CEPP PPA New Water A-2 FEB component. It is recognized that the implementation sequence outlined in the CEPP PIR and CEPP PACR would be necessary to realize the full benefits of each component. The 2014 CEPP PIR acknowledged that implementation of the CEPP plan will occur over many years and include many actions by USACE and SFWMD. This also holds true for the CEPP PACR.

The CEPP PIR Appendix G (Section G.6) evaluated implementation of the CEPP plan by way of three separate PPAs, with each PPA covering a separable element that grouped inter-related project features to provide hydrologic and ecological benefits. These PPAs (PPA North, PPA South, and PPA New Water) include the construction of logical groupings of plan elements, agreed upon by the USACE and SFWMD, that would maximize benefits to the extent practicable consistent with project dependencies (see **Section 6.7.1**) and the AM and Monitoring Plans (see **Section 6.1.4** and **Annex D**). The modifications to the authorized CEPP plan proposed in the CEPP PACR would affect only certain project features covered by the PPA New Water, namely the inclusion of the proposed A-2 storage reservoir and A-2 STA, in lieu of the A-2 FEB, as well as improved conveyance on the NNR and Miami Canal from Lake Okeechobee to the proposed reservoir. The CEPP plan implementation and construction sequencing as presented in the CEPP PIR (**Section 6.7** of the main report and **Appendix G, Section G.6**) for the PPA South, PPA North and PPA New Water (Seepage Barrier Only) would not change as a result of the proposed modifications to the authorized CEPP plan. The proposed A-2 Reservoir, A-2 STA and associated conveyance features would be built concurrently with the CEPP features. CEPP, as modified by the PACR TSP would deliver an average annual flow of approximately 370,000 ac-ft of new water to features included in portions of the CEPP study area covered by PPA South and PPA North.

Federal laws and regulations applicable to implementing the CERP require reports to address certain assurances as part of the project recommendation for approval and subsequent implementation. For the CEPP PIR, the analyses for CEPP associated with Section 601(h)(4) and 601 (h)(5) of WRDA 2000 and the Programmatic Regulations for the CERP (33 CFR Part 385) for Project-Specific Assurances and Savings Clause were conducted for the TSP. The USACE and the SFWMD will undertake updated project assurances and Savings Clause analyses for the selected TSP to be included in the New Water Project Partnership Agreement. The USACE District Engineer will ensure that Project-Specific Assurances and Savings Clause requirements are met, per applicable policies and laws. NEPA documentation will be updated, if applicable, as revisions are made to Water Control Plans and/or Project Operating Manuals associated with the New Water PPA. Compliance with the requirements of the Savings Clause will be maintained throughout the entirety of the implementation period.

6.7.2 Implementation Scenario

The Everglades lie at the center of the complex south Florida regional water management system in which water distributed to any part of the system affects many others. The current system provides most of the inflows to the project area at the peak of the wet season; however, flow is not spatially distributed as desired due to structural limitations and other project constraints. Providing supplemental flows during the periods outside of the peak wet season is ecologically important to reverse the current adverse effects of marsh dry out during the dry months. Providing storage and treatment will serve to both increase water volume and improve the timing of deliveries to the Everglades. Additional storage will also reduce the frequency of undesirable high volume discharges to the Northern Estuaries.

The total benefits predicted (See **Section 6.2.1**) with implementation of the CEPP, as modified by the TSP cannot be achieved without the combination of storage and treatment, distribution and conveyance, and seepage management.

The benefits and construction of PPA North is not dependent on implementation and construction of PPA South and vice versa. The benefits of the CEPP PACR and PPA New Water (Seepage Management Project) are dependent on features in PPA North and PPA South. Construction of the CEPP PACR and PPA New Water (Seepage Management Project) is anticipated to be in parallel with construction of PPA North and PPA South components. **Figure 6-10** includes an implementation scenario with unconstrained resources and funding to demonstrate the duration of construction per PPA, while considering construction dependencies and limitations such as staging and access. This figure illustrates a best-case implementation scenario for simultaneous execution and construction of all three PPAs, which would achieve realization of the full CEPP PACR benefits within 12 years.

Uncertainty surrounding the timing of CEPP project dependencies, funding, resources, stakeholder input and potential conflicting priorities will likely lead to a longer implementation period. The SFWMD is committed to engaging in a public process to integrate CEPP PACR into the IDS that defines the order in which CERP projects would be planned, designed, and constructed. **Figure 6-11** illustrates a constrained construction duration associated with an implementation scenario that constructs PPA North and PPA South in parallel with PPA New Water but constrains the schedule based on an assumed annual funding of $164 M ($50 million Federal and $114 million non-Federal).

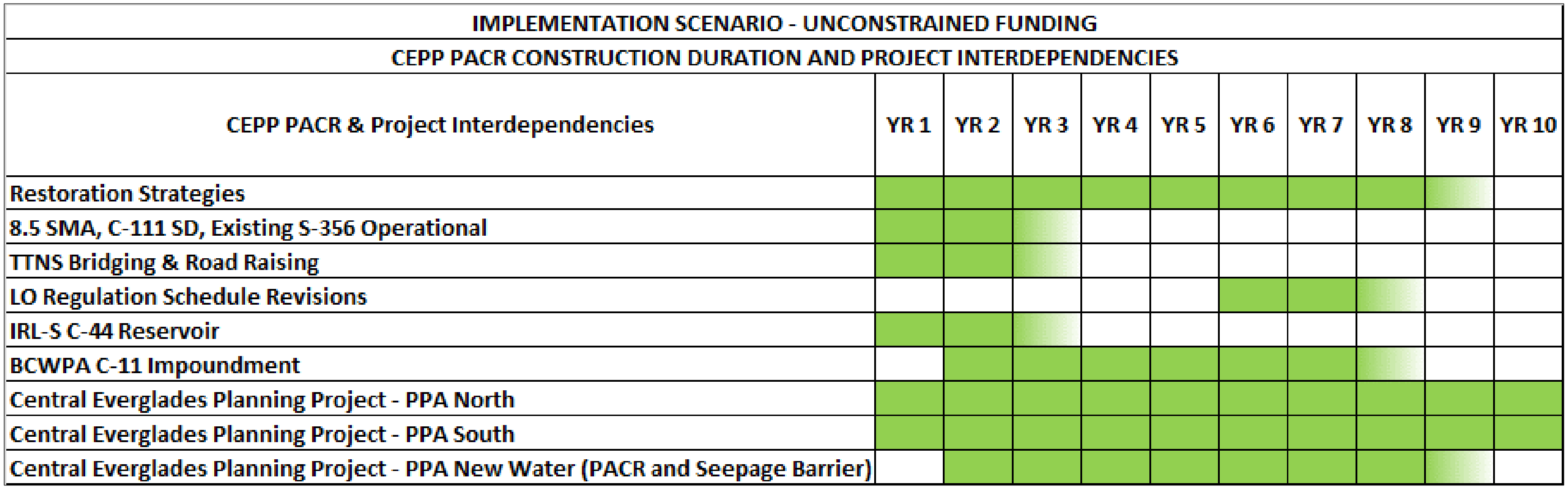

Figure 6-10. CEPP PACR Unconstrained Construction Duration and Project Interdependencies

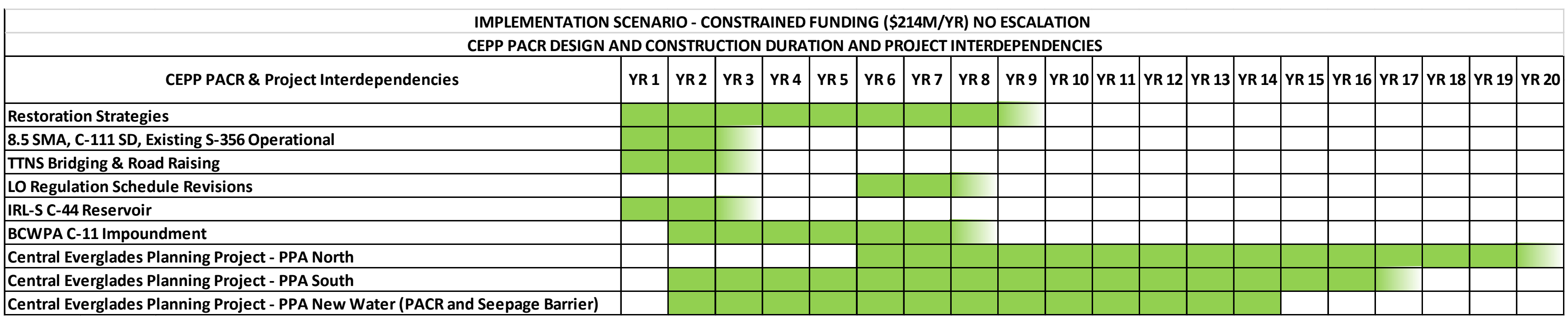

Figure 6-11. CEPP PACR Constrained Construction Duration and Project Interdependencies

Other viable options for the implementation of construction phases and subsequent groupings into PPAs may be considered in the future. This flexibility is essential to successful CEPP and CEPP PACR implementation given the uncertainties associated with the lengthy implementation period and the inevitable improvement in scientific knowledge about the functioning of the Greater Everglades that will occur as planned CERP and non-CERP projects are completed. Deviation from the PPAs outlined above (i.e., PPA North, PPA South, and PPA New Water) would require coordination with SFWMD, HQUSACE, and the Office of the ASA (CW). For example, coordination is required if TSP features are reassigned to a different PPA compared to the groupings that were originally established and presented in the Final PIR/EIS. Features included in the TSP shall not be added to any of the implementation phases without proper coordination or NEPA analysis if necessary.

Federal laws and regulations applicable to implementing the CERP require PIRs to address certain assurances as part of the project recommendation for approval and subsequent implementation. For the CEPP PIR, the analyses for CEPP associated with Section 601(h)(4) and 601 (h)(5) of WRDA 2000 and the Programmatic Regulations for the CERP (33 CFR Part 385) for Project-Specific Assurances and Savings Clause were conducted for the recommended plan. The recommended plan will be implemented in multiple PPAs. The USACE and the SFWMD will undertake updated project assurances and Savings Clause analyses, if necessary, for the implementation phases that are selected to be included in a Project Partnership Agreement or amendment thereto prior to entering into the PPA or PPA amendment. The USACE District Engineer will ensure that Project-Specific Assurances and Savings Clause requirements are met per PPA, per applicable policies and laws. NEPA documentation will be updated, if applicable, as revisions are made to Water Control Plans and/or Project Operating Manuals associated with each PPA. Compliance with the requirements of the Savings Clause will be maintained throughout the entirety of the CEPP and CEPP PACR implementation period.

6.7.3 Preconstruction Engineering and Design

Appendix A represents a limited level of design, but includes documentation of all engineering assumptions and conceptual designs. PED for CEPP features, as modified by the TSP, could begin after Congressional authorization and upon SFWMD's concurrence consistent with the implementation phases. The USACE or SFWMD will prepare an Engineering Design Report updating the conceptual design and prepare initial, intermediate and final plans and specifications for each phase of construction. All work will be coordinated and reviewed between the USACE and the SFWMD, and approved by the USACE and SFWMD prior to construction, to ensure that the work meets USACE standards and regulations and incorporates SFWMD design guidance, as applicable. PED will include site-specific surveys and geotechnical investigations. During the design phase, detailed analyses, subsurface and site investigations will be conducted to prepare construction documents. During PED, project assurances, Savings Clause analysis and operating manuals will be updated consistent with the implementation phases, if necessary. After completion of 60% final plans and specifications for a given project feature, the lead construction agency (USACE or SFWMD) will prepare and submit a CERPRA permit application (Florida Statutes 373.1502) to the FDEP. The FDEP will review the application material to determine if reasonable assurance that the feature will be consistent with State water quality standards in compliance with rules in effect at the time of application. See **Section 6.1** for a list of plan features to be constructed. See **Appendix A** and **Annex C-2** of **Appendix A** for limited design details and conceptual design plates.

6.7.4 Construction

CEPP, as modified by the TSP, would be constructed using conventional means and methods. Multiple contracts would be awarded in a sequenced and phased approach. Construction contracts for project features would not be awarded by the USACE prior to obtaining CERPRA permit authorization or other water quality certification, as applicable. The project features would be sequenced in contracts that maximize opportunities to realize benefits with water that would meet State water quality standards, capitalize on use of onsite material, reduce multiple handling scenarios, and maintain flood control operations of existing features. Adaptive Management would help with future development of the implementation and sequencing.

6.7.5 Operational Testing and Monitoring Period

Prior to initiating the OTMP, each major operational component will undergo a short period of testing and commissioning. The general approach and specific activities anticipated for the OTMP are not expected to change appreciably from that which is included in the authorized CEPP plan (CEPP PIR, Section 6.7.4).

6.7.6 Flood Plain Management and Flood Insurance Programs Compliance

As the TSP is part of the multi-purpose C&SF program, the non-Federal sponsor agrees to participate in and comply with applicable Federal flood plain management and flood insurance programs consistent with its statutory authority. Not less than once each year, the non-Federal sponsor shall inform affected interests of the extent of protection afforded by the authorized CERP project.

The non-Federal sponsor shall publicize flood plain information in the area concerned and shall provide this information to zoning and other regulatory agencies for their use in preventing unwise future development in the flood plain and in adopting such regulations as may be necessary to prevent unwise future development and to ensure compatibility with protection levels provided by the CERP Project.

The non-Federal sponsor shall comply with Section 402 of WRDA 1986, as amended (33 U.S.C. 701b-12), which requires a non-Federal interest to have prepared, within one year after the date of signing a PPA for the authorized CERP Project, a flood plain management plan. The plan shall be designed to reduce the impacts of future flood events in the project area, including but not limited to, addressing those measures to be undertaken by non-Federal interests to preserve the level of flood protection provided by the authorized CERP Project. As required by Section 402, as amended, the non-Federal interest shall implement such plan not later than one year after completion of construction of the authorized CERP project. The non-Federal sponsor shall provide an information copy of the plan to the Government upon its preparation.

The non-Federal sponsor shall prescribe and enforce regulations to prevent obstruction of or encroachment on the authorized CERP project or on the lands, easements, and rights-of-way determined by the Government to be required for the construction, operation, maintenance, repair, replacement, and rehabilitation of the authorized CERP project, that could reduce the level of protection the authorized CERP project affords, hinder operation or maintenance of the authorized CERP project, or interfere with the authorized CERP project’s proper function.

6.7.7 Environmental Commitments

During construction, avoiding, minimizing or mitigating for adverse effects will be achieved by including the following commitments in the contract specifications:

1. The contractor would be required to keep construction activities under surveillance, management, and control to avoid pollution of surface, ground waters, and wetlands. The contract specifications would require the contractor to employ best management practices (BMPs) with regard to erosion and turbidity control.
2. The contractor would be required to prevent oil, fuel, or other hazardous substances from entering the air, ground, drainage, local bodies of water, or wetlands. The contract specifications would require that the contractor adopt safe and sanitary measures for the disposal of solid wastes and would require a spill prevention plan. The contractor would also be required to transport and dispose of any construction and demolition debris in accordance with applicable requirements.
3. The contractor would be required to keep construction activities under surveillance and control to minimize damage to the environment by noise and pollution of air resources.
4. The contractor would be required to keep construction activities under surveillance, management, and control to minimize interference with, disturbance to, and damage of fish and wildlife. The contractor would be required to inform the construction team of the potential presence of threatened and endangered species in the work area, the need for construction conservation measures, and any requirements resulting from ESA Section 7 consultation.
5. The contractor would be required to take appropriate measures to protect historic, archeological and cultural resources within the work area.
6. The contractor would be required to keep construction activities under surveillance, management, and control to prevent the transfer and spread of invasive species due to construction activities. The contract specifications would require the contractor to employ BMPs and measures to prevent the transfer and spread of invasive species.

6.8 COMPLIANCE WITH CERP PROGRAMMATIC REGULATIONS (33 CFR 385)

The proposed modifications to the authorized CEPP plan, as reflected in the TSP, have been developed in compliance with the CERP Programmatic Regulations. **Table 6-22** provides a summary of the programmatic regulations requirements, including how and where those requirements have been addressed in this report. Subpart A sections, which include the General Provisions of the Programmatic Regulations, are not included in the table.

Table 6-22. Compliance with CERP Programmatic Regulations (33 CFR Part 385)

Section	Section Title	Documentation of Compliance
Subpart B - Program Goals and Responsibilities		
385.8	Goals and purposes of CERP	PACR **Section 1** - The PACR proposes a modification to the Federally authorized CEPP to include additional storage and treatment in the EAA. The proposed modification is consistent with Component G of CERP and, thus, consistent with goals and purposes of CERP
385.9	Implementation principles	PACR **Sections 3, 4, and 6** - The proposed modifications to the authorized CEPP have been formulated, evaluated, and justified based on ability to contribute to CERP goals and purposes and to provide benefits that justify costs on a next-added increment basis.
385.10	Implementation responsibilities, consultation, and coordination	PACR **Section 1** - The PACR has been prepared by SFWMD in accordance with Section 203 of WRDA 1986, as amended. Accordingly, the PACR does not fully cover the Federal coordination and consultation requirements that will be completed by USACE upon submittal of the report to the ASA(CW). The PACR will be reviewed for compliance with Federal laws and regulations (including compliance with Federal responsibilities under NEPA), approved by ASA(CW), and subsequently transmitted by ASA(CW) to Congress for authorization.
Subpart C - CERP Implementation Processes		
385.11	Implementation process for projects	The SFWMD-prepared PACR in accordance with Section 203 of WRDA 1986, as amended, has been conducted in a manner consistent with applicable joint USACE/SFWMD processes defined in this section of the Programmatic Regulations.
385.12	Pilot projects	Not applicable to CEPP PACR.
385.13	Projects implemented under additional authority	Not applicable to CEPP PACR.
385.14	Incorporation of NEPA and related considerations into the implementation process	PACR **Sections 1, 2, 3, 4, 5, and 6** – The PACR has been developed in compliance with NEPA and applicable implementing regulations.
385.15	Consistency with the requirements of the State of Florida	PACR **Section 7.4** addresses compliance with Florida statutes and Annex B includes the SFWMD's State Compliance Report addressing the criteria for approval listed in Section 373.1501 F.S.
385.16	Design agreements	The PACR proposes modifications to the Federally authorized CEPP. After the PACR is authorized, the design changes will be addressed under the existing Design Agreement for CERP, as amended.

Table 6-22. Compliance with CERP Programmatic Regulations (33 CFR 385) (continued)

Section	Section Title	Documentation of Compliance
385.17	Project Delivery Team	The CEPP PACR was prepared by the SFWMD under Section 203 of WRDA, as amended. The USACE was not directly involved in the initial PACR development, and the Tribes, Federal agencies, and State agencies were not involved in the same manner as a traditional Project Implementation Report (PIR). Upon transmittal of the PACR to ASA(CW), all entities identified as PDT members in the regulation will be involved in traditional coordination and consultation activities normally conducted for PIRs
385.18	Public outreach	PACR **Section 7.1** and **Appendix C.3** address public involvement activities. Environmental justice considerations were addressed in **Sections 4 and 7**. Multiple public meetings and other proactive public outreach efforts were conducted during development of the PACR.
385.19	Environmental and economic equity	Environmental justice considerations (environmental and economic) were addressed in **Sections 4 and 7**.
385.20	REstoration COordination and VERification (RECOVER)	CEPP PACR (**Appendix D**) includes minor adjustments/updates to the adaptive management and monitoring plan for CEPP. The RECOVER System-wide Evaluation (Annex E to the CEPP PIR) is equally applicable to the TSP in the CEPP PACR.
385.21	Quality control	The SFWMD developed and implemented a Project Management Plan and a Review Plan to guide quality control efforts for the CEPP PACR development.
385.22	Independent scientific review and external peer review	During development of the CEPP PACR by the SFWMD, an Independent External Peer Review (IEPR) was conducted in accordance with USACE civil works review guidance (ER 1165-2-214), facilitated by the same contractor that USACE uses for its IEPRs. Following submittal of the PACR to ASA(CW) for processing, appropriate interagency and scientific peer review processes established for CERP would be triggered by USACE.
385.23	Dispute resolution	Not applicable.
385.24	Project Management Plans	The SFWMD developed a Project Management Plan for development of the CEPP PACR.
385.25	Program Management Plans	Not applicable to the CEPP PACR. The PACR does not involve a program level activity.
385.26	Project Implementation Reports	The CEPP PACR proposes a modification to the Federally authorized CEPP, focusing only on modifications to storage, treatment, and conveyance of water in the EAA. The PACR development followed the USACE Planning Guidance Notebook (ER 1105-2-100) and other relevant USACE guidance. The PACR plan formulation process considered the Comprehensive Review Study (Yellow Book) alternative for storage in the EAA in accordance with 33 CFR 385.26(b)(2). Refer to **Section 3.3** of the PACR for consideration of the Yellow Book alternative.

Table 6-22. Compliance with CERP Programmatic Regulations (33 CFR 385) (continued)

Section	Section Title	Documentation of Compliance
385.27	Project Cooperation Agreements	The proposed modifications to CEPP addressed in the PACR will be covered by the future CEPP New Water PPA when the modifications are approved by ASA(CW) and authorized.
385.28	Operating Manuals	The draft Project Operation Manual for the authorized CEPP (Annex C of the CEPP PIR) has been updated to incorporate the operational aspects of the proposed modifications in the PACR.
385.29	Other project documents	Not applicable to this CEPP PACR.
Subpart D - Incorporating New Information into the Plan		
385.30	Master Implementation Sequencing Plan (MISP)	Proposed modifications to CEPP addressed in the PACR will be integrated into the MISP upon review and approval by the ASA(CW) and authorization by Congress.
385.31	Adaptive management program	The adaptive management and monitoring plan for the authorized CEPP (Annex D of the CEPP PIR) has been adjusted/updated to incorporate proposed modifications to CEPP addressed in the PACR.
385.32	Comprehensive Plan Modification Report	The PACR does not constitute a change to CERP that would require a modification report as defined in section 385.31 of the Programmatic Regulations.
385.33	Revisions to models and analytical tools	Development of the PACR did not involve revisions to models and analytical tools used for the authorized CEPP.
385.34	Changes to the Plan	The Plan will be updated, as appropriate, upon review and approval of the PACR by the ASA(CW) and subsequent authorization by Congress.
Subpart E - Ensuring Protection of the Natural System and Water Availability Consistent With the Goals and Purposes of the Plan		
385.35	Achievement of the benefits of the Plan	PACR **Section 6 and Annex B**
385.36	Elimination or transfer of existing legal sources of water	PACR **Section 6.9.2.1 and Annex B** (Section B.2.4)
385.37	Flood protection	PACR **Section 6.9.2.2 and Annex B** (Section B.2.5)
385.38	Interim goals	PACR **Section 6.2.2**
385.39	Evaluating progress towards other water-related needs of the region provided for in the Plan	PACR **Section 6 and Annex B** (Section B.2.6)
385.40	Reports to Congress	Not applicable to the CEPP PACR

This feasibility report is being prepared under Section 203 guidelines which allows for a non-Federal sponsor to conduct analysis outlined by the Programmatic Regulations to align with USACE and Federal Policy however certain actions require a Federal Agency and are to be undertaken after the feasibility report is submitted to the ASA for review and approval. Per the Programmatic Regulations and current USACE policy, the following actions have been taken in support of the TSP:

1. The PACR has identified water to be reserved or allocated for the natural system. **Annex B** addresses this requirement.
2. The TSP has been evaluated in light of its potential effects on existing legal sources of water and the level of service for flood protection. **Annex B** addresses this requirement.
3. WRDA 2000, the authorizing legislation for CERP, has now made a formal monitoring plan a requirement for all CERP restoration projects. The TSP includes adaptive management, water quality, hydrometeorologic, and ecological monitoring activities to ensure that the intended purposes of the project would be achieved through long term operations. **Annex D** addresses this requirement.
4. In addition to the project level monitoring plan, the PACR has developed a nuisance and exotic vegetation control plan which strives to either prevent or reduce the establishment of invasive and non-native species within the project area. **Annex D** addresses this requirement.
5. USACE guidance interpreting the WRDA of 2007 (Section 2039), requires preparation of an adaptive management plan for all ecosystem restoration projects. Adaptive management is a formal process for continually improving management policies and practices by learning from their outcomes. In the context of CEPP PACR, the adaptive management plan provides an approach for addressing project uncertainties by testing hypotheses, linking science to decision making, and adjusting implementation of the project as necessary, to improve the probability of restoration success. **Annex D** addresses this requirement.
6. Upon submission to the ASA (CW) office for review and approval, the TSP will be evaluated in light of its potential effects on fish and wildlife resources including effects to Federally listed species. Section 7 consultation with the USFWS is anticipated to begin, leading to a Biological Opinion (BO).

6.9 PROJECT ASSURANCES AND SAVINGS CLAUSE SUMMARY

WRDA 2000 requires the inclusion of Project-Specific Assurances and the Savings Clause analyses within each CERP PIR. Project-Specific Assurances ensure that the water needed for the natural system to achieve CERP restoration goals is identified and subsequently protected from other potentially competing uses. The Savings Clause protects existing legal sources of water supply, such as water for municipal and agricultural uses, and ensures that CERP implementation does not reduce the level of service for flood protection. Refer to **Annex B** for complete documentation of the Project Assurances and Savings Clause analysis for the TSP, responsive to the requirements of WRDA 2000.

The analyses for Project Assurances and the Savings Clause followed identification of the TSP during plan formulation. In the **Annex B** analysis, the potential effects are analyzed through comparison of the TSP to the FWO. This comparison segregates the effects of the intervening non-CERP and intervening CERP projects. In addition, **Annex B** also compares the TSP to the existing conditions (ECB) to inform evaluators of the cumulative potential effects of the CEPP PACR, CEPP and other intervening CERP and non-CERP projects relative to conditions experienced previously.

6.9.1 Project Assurances: Identification of Water Made Available for the Natural System and Water for Other Water-Related Needs

Section 601(h)(4) of WRDA 2000, entitled "Project-Specific Assurances", requires CERP PIR reports to:

- identify the appropriate quantity, timing, and distribution of water dedicated and managed for the natural system
- identify the amount of water to be reserved or allocated for the natural system necessary to implement under State law

The 2003 Programmatic Regulations for the CERP, which were developed in response to statutory requirements in WRDA 2000, further established the processes and procedures to guide the Corps in the implementation of the CERP. Section 385.35(b) of the Programmatic Regulations requires that each PIR identify the quantity, timing and distribution of water to be dedicated and managed for the natural system necessary to meet the restoration goals of the CERP. This evaluation considers the availability of the pre-CERP baseline water and previously reserved water, and whether improvements in water quality are necessary. Section 385.35(b) of the Programmatic Regulations also requires that procedures be developed for identifying water generated by the CERP for use in the human environment and specifies that the quantity, timing and distribution of water for other water-related needs be identified in CERP PIRs.

6.9.1.1 Project Assurances: Identifying Water for the Natural System

The identification of water for the natural system captures the quantity, timing, and distribution of water. Hydrologic model data extracted from the RSM-GL simulations was used to develop the volume probability curves at three specified locations in the regional system: inflows to WCA 3, inflows to ENP, and overland flows towards Florida Bay, including overland flows at Shark River Slough. Although there is only a statistical relationship between Shark River Slough hydrology and Florida Bay salinity, and there needs to be a better understanding of the geophysical mechanisms that control salinity, the statistical models indicate that additional inflows to Shark River Slough will have an indirect effect on salinities in Florida Bay.

These specified locations represent the inflows to the three basins where ecosystem benefits (habitat units) are expected as a result of implementation of the TSP. Specifically, the volumes of water at the 10th, 50th, and 90th percentiles are identified and compared for the pre-project (FWO) (**Table 6-23**) condition and the TSP (future with project) conditions (**Table 6-24**). The water made available by the project (differences between the TSP and FWO, which were computed for each water year within the RSM period of simulation) for the natural system can be found in **Table 6-25**. The difference between the FWO and TSP shown in **Table 6-25** may reflect a variety of conditions. The resulting difference between FWO and TSP is sorted (high to low) to generate the probabilities and may result from a variety of meteorological conditions. For example, during the extreme wet years the TSP allows for excess water to be stored in the reservoir to avoid high water conditions downstream. This operational capability avoids recreational closures and relieves stress on tree islands, etc., indicated by the reduction in flow volumes during extended wet events. During dry conditions, the inflows for one year in the period of record may be less in the TSP than the FWO due to diminishing supplies. The difference between the TSP and FWO at the 90th percentile and higher is less than 1-1.5% percent of the average annual increase at the 10th percentile (**Figure 6-12**).

Table 6-23. Pre-Project Volume of Water Available for the Natural System

Pre-project Water Available for the Natural System (FWO)			
Location	Water Available equaled or exceeded 10% of Water Years (1,000 ac-ft)	Water Available equaled or exceeded 50% of Water Years (1,000 ac-ft)	Water Available equaled or exceeded 90% of Water Years (1,000 ac-ft)
WCA 3	1,023	723	257
ENP	2,711	1,271	535
Florida Bay	1,328	1,888	372

Table 6-24. TSP Volume of Water Available for the Natural System

Total Water Available for the Natural System (TSP)			
Location	Water Available equaled or exceeded 10% of Water Years (1,000 ac-ft)	Water Available equaled or exceeded 50% of Water Years (1,000 ac-ft)	Water Available equaled or exceeded 90% of Water Years (1,000 ac-ft)
WCA 3	1,205	782	244
ENP	2,925	1,333	528
Florida Bay	1,521	1,945	367

Table 6-25. Water Made Available by the Project for the Natural System

Water Made Available by the Project (difference between TSP and FWO)			
Location	Water Made Available equaled or exceeded 10% of Water Years (1,000 ac-ft)	Water Made Available equaled or exceeded 50% of Water Years (1,000 ac-ft)	Water Made Available equaled or exceeded 90% of Water Years (1,000 ac-ft)
WCA 3	182	58	-13
ENP	214	62	-7
Florida Bay	193	58	-5

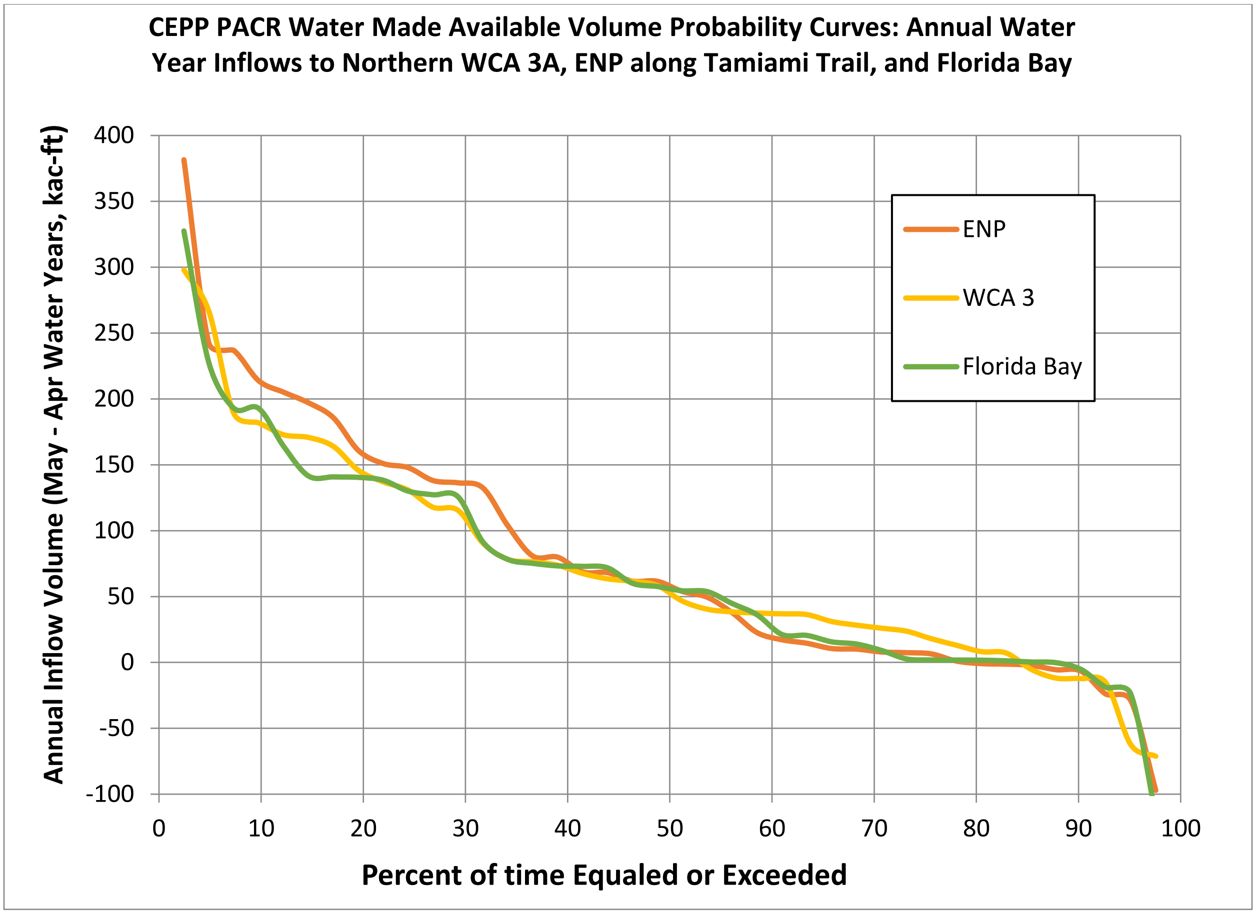

Figure 6-12. CEPP PACR Water Made Available Volume Probability Curves: Annual Water Year Inflows to Northern WCA 3A, ENP and Florida Bay

6.9.1.2 Water to be Reserved or Allocated for the Natural System

The TSP provides additional water for the natural system. As required by Section 601(h)(4)(A) of the of the WRDA 2000 and Section 385.35 of the Programmatic Regulations for the Implementation of CERP, the water made available by the project will be protected using the State of Florida's reservation or allocation authority under State law as represented by **Table 6-25**. The SFWMD has protected the pre-project water for the natural system in the Holey Land and Rotenberger Wildlife Management Areas; WCA 1, WCA 2A, WCA 2B, WCA 3A, and WCA 3B; and ENP through the Restricted Allocation Area Rule for the Everglades and North Palm Beach/Loxahatchee River Watershed water bodies. The combination of protecting the pre-project existing water and the water made available by the project features is required for the project to achieve its intended benefits.

The SFWMD will protect the water made available by the project features using its reservation or allocation authority as required by 373.470, Florida Statutes (F.S.). Protection of water made available by project features is required in order for the SFWMD and the Department of the Army to enter into a PPA to construct the project features.

6.9.1.3 Project Assurances: Identifying Water Made Available for Other Water Related Needs

The ability of the project features to provide water to meet other water related needs in the LOSA, which includes the EAA, was analyzed for the TSP. Based on the analysis, the level of service for the LOSA water supply has not improved, nor has it been degraded by the project. Therefore, no water was quantified for other water related needs in the LOSA. Water stored in the A-2 Reservoir, a portion of which comes directly from Lake Okeechobee, could be returned to the Miami and/or North New River basins to maintain canal levels when excess capacity is available. These return flows can occur when restoration flows to the Everglades are met and if the depth in the reservoir is above 8.2 feet (approximately one-third of the reservoir storage volume). The remaining water in the A-2 Reservoir below 8.2 feet in depth is solely dedicated for environmental purposes. If during water supply operations the full canal conveyance capacity is not being utilized, additional releases from the lake to the A-2 Reservoir could take place according to the operational protocol for Lake Okeechobee.

The existing level of service for existing legal users is maintained with the TSP. The TSP also provides some ancillary benefits during LOSA water shortage when compared to the ECB and FWO project conditions. See **Figure 6-13.**

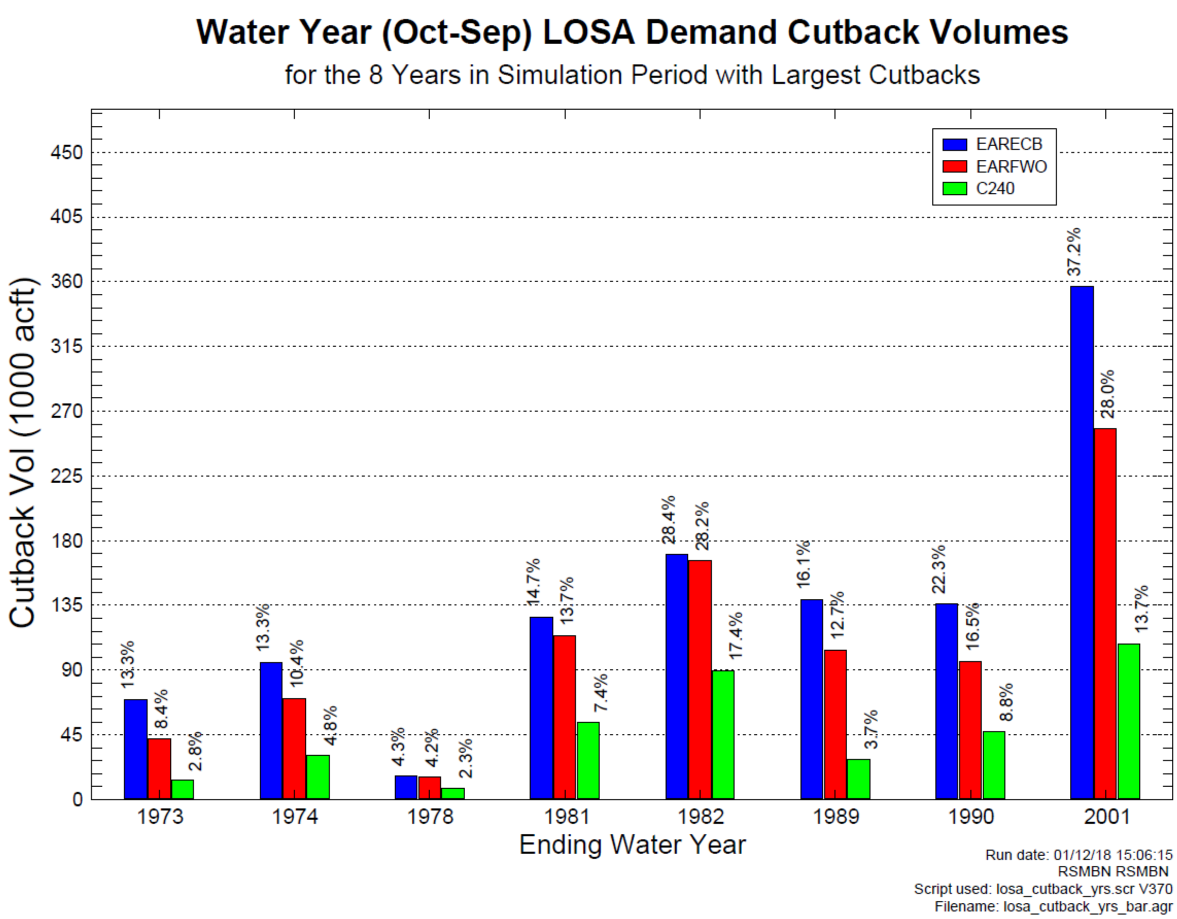

Figure 6-13. Water Year (Oct-Sep) LOSA Demand Cutback Volumes

6.9.2 Savings Clause Summary

The Savings Clause analyses, described in Section 601(h)(5) of WRDA 2000, is a means to protect users of legal sources of water supply and flood protection that were in place at the time of enactment of WRDA 2000. Section 385.36 of the Programmatic Regulations requires that CERP PIRs determine if existing legal sources of water will be eliminated or transferred as a result of project implementation. If a project is expected to result in an elimination or transfer of an existing legal source of water, the PIR shall include an implementation plan that ensures a new source of water of comparable quantity and quality is available to replace the source that is being transferred or eliminated. Section 385.36 of the Programmatic Regulations requires that CERP PIRs include analyses to ensure the level of service for flood protection will not be reduced by implementation of the CERP project features.

6.9.2.1 Savings Clause: Water Supply from Existing Legal Sources

Sources of water to meet agricultural and urban demand in the LOSA and LECSAs will continue to be met by their current sources, primarily Lake Okeechobee, the Everglades (including the WCAs), surface water in the regional canal network, and the surficial aquifer system. Sources of water for the Seminole Tribe of Florida and Miccosukee Tribe of Indians of Florida are also influenced by the regional water management system (C&SF Project, including Lake Okeechobee); however, these sources will not be affected by the CEPP PACR project. In addition, water supplies to ENP with implementation of the TSP exceed FWO project and ECB volumes. Water sources for fish and wildlife located in the Northern Estuaries, WCA 2, WCA 3, and Florida Bay will not be diminished. Therefore, there will be no elimination or transfer of existing legal sources of water supply as a result of the TSP for the following:

- Agricultural or urban water supply in the LOSA and LECSA
- Allocation or entitlement to the Seminole Indian Tribe of Florida under Section 7 of the Seminole Indian Land Claims Settlement Act of 1987 (25 U.S.C. 1772e)
- The Miccosukee Tribe of Indians of Florida
- Water supply for ENP
- Water supply for fish and wildlife

Similar to CEPP, there are several project dependencies that may affect or be affected by the CEPP PACR; however, the TSP would maintain the level of service for water supply for existing legal users.

6.9.2.2 Savings Clause: Flood Protection

Comparison of canal stages and groundwater levels at key locations (refer to **Annex B** for complete details) indicate that implementation of the project will not reduce the levels of service for flood protection within the areas affected by the project, including the EAA, LECSA 2, and LECSA 3. This includes the areas affected by the project including the Seminole Indian Tribe of Florida's Big Cypress Reservation and the Miccosukee Tribe of Indians of Florida's reservation areas and resort.

The CEPP PACR TSP maintains the pre-project flood protection level of service for the EAA by providing total pumping capacity in excess of the existing capacity. After the completion of STA 3/4, flood control in the Miami Basin and the NNR Basin were transferred to new pump stations G-372 and G-370, with a combined capacity similar to the original C&SF project pump stations, S-8 (4,170 cfs) and S-7 (2,490 cfs), to provide drainage for the upstream EAA basin.

6.10 PROJECT CONCERNS AND CONTROVERSIES

The project concerns and controversies discussed in detail in Section 6.9 of the CEPP PIR would not be affected by the TSP. Additional information pertaining to a CERP, CEPP, and CEPP PACR comparison is discussed below.

Since CERP, updated science, new information, improved hydrologic modeling tools, and varying water treatment assumptions have led to the differences in CERP components and the TSP. There are six CERP (Yellow Book) components which have features or increments included within the components in the recommended plan: (1) EAA Reservoirs; (2) Flow to Northwest and Central WCA 3A; (3) WCA 3 Decompartmentalization and Sheetflow Enhancement; (4) S-356 Pump Station Modifications; (5) L-31 Levee Seepage Management; and (6) System-wide Operational Changes-Everglades Rain Driven Operations. These six CERP components were built upon (additional components of CERP added) as CEPP progressed through the scoping period. Some of the components considered during scoping and detailed analysis were not retained in the recommended plan. Reference the CEPP PIR Section 1 and Section 3 or CEPP PIR Appendix E for details. A comparison of the CERP/CEPP/CEPP PACR feature functions, elements and costs was completed for inclusion in the CEPP PACR. The differences between the CERP and CEPP features are illustrated in **Appendix B** (CERP, CEPP and CEPP PACR Comparison). A descriptive comparison of features listed above are referenced in the CEPP PIR Section 6.9.9.

6.11 RISK AND UNCERTAINTY

The project risks and uncertainties discussed in detail in Section 6.10 of the CEPP PIR would not be affected and are the same for the TSP. Risk and uncertainty in the CEPP FWO and CEPP PACR TSP performance is addressed in **Annex D, Adaptive Management and Monitoring Plans**. Additional information pertaining to Sea Level Change is discussed below.

6.11.1 Sea Level Change

The effects of sea level change were analyzed in the CEPP PIR per EC 1165-2-212 (Sea Level Change Considerations for Civil Works Programs). Refer to the CEPP PIR Annex I for the detailed analysis conducted for CEPP. This analysis addressed how sea level change might reduce the benefits predicted for the recommended plan under CEPP (Alternative 4R2, which is now the Federally authorized CEPP plan). In particular, the assessment addressed how sea level rise (SLR) over the next 100 years may interfere with the restoration benefits from the CEPP in the St. Lucie Estuary, Caloosahatchee River Estuary, and Florida Bay. The assessment incorporated all CEPP project components from Lake Okeechobee to the Everglades National Park, including the connectivity of the North New River Canal and the Miami Canal across Areas A-1 and A-2. However, it did not directly address the proposed A-2 Reservoir as outlined in the PACR TSP. Subsequent to the CEPP PIR SLR analysis, EC 1165-2-212 was replaced by ER 1100-2-8162 (December 2013). The SLR analysis conducted for the CEPP PIR is not expected to have appreciably changed since the CEPP PIR was prepared. The SFWMD is working with USACE Jacksonville District to update the SLR analysis for the CEPP PACR.

The purpose of the CEPP, including the proposed modifications in the TSP, is to improve the quantity, quality, timing, and distribution of water flows to the central Everglades, while decreasing the magnitude and frequency of flows to the Northern Estuaries. The CEPP will increase water delivered past Tamiami Trail, maintain the quantity and quality of water supplied to Miami-Dade County and Biscayne Bay, and decrease water flow to the north to improve the ecological conditions in the St. Lucie Estuary and Caloosahatchee Estuary. Elevations in the project area range from approximately 0 to 6 feet mean sea level (MSL) with the lowest elevations in the south and along the coastline. The low elevations indicate the area will be affected by SLR, which is projected to be 2 to 6 ft over the next 100 years. For example, under a high rate sea level rise scenario without any intervention, habitat function in the St. Lucie Estuary, Caloosahatchee River Estuary, and Florida Bay would be reduced by 21% over the next 50 years due to SLR alone. These adverse effects from SLR would interfere to some extent with the benefits realized by the CEPP restoration efforts. Within the next 50 years the restoration benefits of CEPP are likely to be reduced by approximately 8% due to naturally occurring SLR. This relatively moderate decrease in benefits occurs largely because of habitat losses due to SLR in the Northern Estuaries and Florida Bay when compared to the future conditions without CEPP. Notably, the habitat function for all areas of concern would be substantially better with CEPP in place under any future SLR scenario when compared to future scenarios without CEPP.

However, when considering total freshwater wetland habitat, sea level rise will significantly reduce this habitat area. For instance, under the high rate sea level change scenario, total project area habitat function will be reduced by 8%, 21%, and 37% at the 20-, 50-, and 100-year timelines, respectively. The total habitat function is significantly higher with CEPP in place under any SLR scenario and timeframe when compared to the CEPP PIR FWO condition. The ability of the CEPP project to provide significantly higher habitat functionality when compared to the CEPP PIR FWO is partly a function of the increase in freshwater that reduce the loss of freshwater habitat within ENP. The most significant uncertainties associated with the sea level change impact projections provided here are: 1) the lag time between when freshwater wetlands become significantly impaired due to salinity impacts and when replacement estuarine habitat becomes fully productive, and 2) the degree to which project related water reservations will protect natural system water supplies given SLR related demand from the developed areas.

The TSP that includes the proposed A-2 Reservoir, A-2 STA, conveyance improvements and associated infrastructure would provide additional flow to the central Everglades above those provided in CEPP. The additional water being moved south as opposed to being released to tide through the Northern Estuaries will help combat some of the effects of SLR. No amount of freshwater will be able to hold back SLR, but the additional water which will be delivered through the central Everglades to the south end of the system will benefit the southern glades and near shore Florida Bay. The timing and distribution of these additional flows provides improved groundwater recharge and overland flow in the central portion of the lower Florida peninsula. As a result, the future with project condition is expected to reduce salt water intrusion in the surficial aquifer system and nearshore environment at the coast. Therefore, the TSP would have a net beneficial effect in the context of the 2014 SLR assessment and all future SLR scenarios (CEPP PIR Annex I).

The RECOVER team continues to evaluate climate change, SLR, and vulnerability analysis that will feed back into the detailed design and adaptive management in the future. The SFWMD and the USACE will update the 2014 SLR assessment to reflect the proposed operating scenario for the TSP during preconstruction engineering and design (PED) to ensure the reduction in flow to the Northern Estuaries when combined with SLR would not reduce the benefits from the CEPP to less than beneficial.

6.12 INDEPENDENT AND TECHNICAL REVIEWS

Technical Review: SFWMD contracted with a third party to perform an Independent External Peer Review (IEPR) of the draft CEPP PACR for the EAA Storage Reservoir project FS/DEIS in February and March 2018. Independent, objective peer review is regarded as a critical element in ensuring the reliability of scientific analysis. The purpose of the IEPR is to provide an independent assessment of the project. Assessments include the adequacy and acceptability of the economic, engineering and environmental methods; models, data and analyses used; the range of alternatives; and the adequacy of risk and uncertainty analyses. SFWMD has engaged the same professionals who typically perform this work when the U.S. Army Corps of Engineers is the lead for a project. The results of the IEPR are provided in **Annex E**.

In lieu of a cost certification, the SFWMD also contracted with a third party to perform an independent review of the cost analysis including the MCACES, the proposed construction schedule, the risk register and other documents supporting the cost estimate that was prepared for the PACR. The cost review was also performed in February and March 2018. Results of the cost review are provided in **Annex E**.

Regulatory and Partner Agency Review: Section 373.1501 of Florida Statutes established Florida Department of Environmental Protection (FDEP) oversight to ensure that SFWMD conducts the required evaluations for all Comprehensive Everglades Restoration Plan (CERP) projects. SFWMD has evaluated and will continue to report on how the high-performing alternatives are technically feasible and cost effective. Beginning in mid-January, SFWMD will provide necessary and relevant information to FDEP to ensure consistency with all State laws and that the project can be permitted and operated as proposed, considering:

a. Water resource issues including water supply, water quality, flood protection and threatened and endangered species.
b. Project feasibility to determine if CEPP features are cost effective, consistent with CERP and can be operated as part of the C&SF system.
c. Consistency with State and Federal laws.
d. Project assurances to determine that there are no adverse impacts on existing legal users, no diminishment of existing levels of flood protection and that adaptation of water management practices meet restored natural environment.
e. Coordination between utilities and public infrastructure entities has taken place, reducing impacts to relocation of public infrastructure and utilities.

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7.0 ENVIRONMENTAL COMPLIANCE

7.1 PUBLIC INVOLVEMENT

7.1.1 Scoping

The SFWMD held six project scoping meetings in both West Palm Beach (4) and Clewiston (2) to engage the public in scoping of key issues to be addressed in development of the CEPP PACR. Notices of the meetings were published in the Florida Administrative Weekly. The scoping meeting and comment period was identified as an open process utilized to define the purpose and need of the action (or project), identify any issues, determine the project point of contact, establish the project schedules and provide recommendations to the agency. A copy of the meeting notices, scoping letters received, and a comment response matrix are located in **Appendix C.3**. A total of 10 public workshops were held between October 23, 2017 and December 22, 2017 to inform the public and obtain public feedback. **Table 7-1** provides meeting and noticing details.

Table 7-1. Public Meeting Summary

Date	Meeting	Content	Location	Time	FAR Notice Published
10/23/2017	Public Scoping Meeting #1	Public Scoping, project introduction	Clewiston	5:30p-7:30p	10/16/2017
10/26/2017	Public Scoping Meeting #1	Public Scoping, project introduction	West Palm Beach (WPB)	9:00a-11:00a	10/16/2017
10/31/2017	Public Meeting #2	Scope & Schedule, features, planning assumptions, and tools	WPB	9:00a-11:00a	10/23/2017
11/6/2017	Public Meeting #3	Project study, Scope and Schedule, plan formulation, base condition modeling, array of alternatives, ROM costs	WPB	9:00a-11:00a	10/30/2017
11/15/2017	Public Meeting #4	Summary of public meeting info & project status to-date	Clewiston	5:30p-7:30p	11/8/2017
11/16/2017	Public Meeting #4	Summary of public meeting info & project status to-date	WPB	6:00p-8:00p	11/8/2017
11/29/2017	Gov. Agency Coordination Meeting #1	Summary of public meeting info & project status to-date	WPB (webinar)	9:00a-10:00a	11/21/2017
12/5/2017	Public Meeting #5	Summary of public input to date, model conceptualization, cost benefit analysis, protecting the natural system	WPB	9:00a-11:00a	11/28/2017
12/13/2017	Public Meeting #6	Alternatives Evaluation, Modeling results, ROM costs	WPB	9:00a-11:00a	12/6/2017
12/21/2017	Public Meeting #7	TSP selection and identification, CE/ICA analysis and habitat units	WPB	9:00a-11:00a	12/13/2017

The SFWMD has initiated discussions with the USACE Jacksonville District (SAJ) requesting their cooperation and support in the development and evaluation of alternatives for completion of the CEPP PACR (Integrated Feasibility Report and DEIS). The following is a summary of coordination efforts between the SFWMD and the USACE SAJ and South Atlantic Division (SAD) from July 2016 to publication of this report:

1. July 26, 2016: ASA(CW) Jo-Ellen Darcy sent a letter to Congressman Patrick Murphy stating that the Army is prepared to initiate the EAA Reservoir PIR planning quickly, once a non-Federal Sponsor for the study is identified. (Enclosure A-1).
2. June 26, 2017: SFWMD sent a letter to COL Jason Kirk requesting that USACE SAJ work with SFWMD to develop a Post-Authorization Change Report (PACR) for the Central Everglades Planning Project (CEPP) in accordance with the schedule and milestones defined in Florida Senate Bill 10.
3. July 24, 2017: COL Kirk responded to SFWMD's letter indicating that USACE SAJ was evaluating options for providing the requested support; that SAJ would work with the USACE's Vertical Team to ensure the options were legally sufficient, policy compliant and implementable; and that SAJ would get back to SFWMD with a fully informed response by August 31, 2017.
4. July 26, 2017: SFWMD sent a letter to Eric Summa, Chief of the SAJ Planning and Policy Division, requesting how the SFWMD could help: a) support the USACE's efforts to participate in planning an EAA storage reservoir and meet the schedule outlined in SB-10; b) reduce the uncertainty of USACE approval if SFWMD takes a lead role in the PACR feasibility study under Section 203; and c) deliver a plan that can successfully navigate the Federal administrative process and Congressional authorization process to allow a 50-50 cost-share on the construction of the recommended plan.
5. August 31, 2017: USACE SAJ Commander COL Kirk sent a letter to SFWMD outlining five (5) optional courses of action for SFWMD to work with the USACE to plan and implement the EAA Reservoir outlined in SB-10, and recommended Course of Action #3 which was to use the USACE's existing authority to develop a Project Implementation Report (PIR) for the EAA reservoir, noting that the USACE currently did not have a budget to work on this PIR in FY2018 and that the USACE would need to identify a funding source.
6. September 27, 2017: SFWMD sent a letter to USACE SAJ Commander COL Kirk stating that SFWMD had funding to support the USACE's efforts on development of an expedited PACR in accordance with the USACE's Course of Action #1, or to pay the Corps for technical assistance in SFWMD's effort to develop a PACR under authority provided by Section 203 of WRDA-1986, as amended, as outlined in the USACE's Course of Action #4.
7. October 12, 2017: SFWMD Governing Board Chairman Dan O'Keefe sent a letter to Acting ASA(CW) Doug Lamont requesting technical assistance from the USACE on a Section 203 feasibility study to develop the CEPP PACR.
8. October 24, 2017: Doug Lamont, Acting ASA(CW) sent a letter to SFWMD stating that the ASA(CW) Office fully supported SFWMD efforts on the feasibility study and that his staff had been directed to assist SFWMD with the preparation of a Memorandum of Agreement (MOA), and that Brigadier

General Holland, SAD Commander, has been delegated authority to sign the Section 203 Agreement.

9. October 24, 2017: SFWMD submitted a Draft Scope of Work for its requested technical assistance from the USACE.
10. November 9, 2017: USACE SAJ communicated to SFWMD that, after review of SFWMD's Scope of Work, USACE SAJ and SAD had determined that they had authority to provide technical service requested for approximately 70% of the tasks, but that they did not believe they had authority to fulfill the remaining 30% of the requested tasks. In the interest of time, SAJ and SAD requested that SFWMD break its Scope of Work into two parts that could be covered under two separate Support Agreements. Support Agreement No. 1 would include those technical assistance tasks that SAJ and SAD believed that they had authority to provide without further coordination with Headquarters.
11. October 26, 2017: SFWMD sent a letter to Tim Murphy, SAJ Deputy District Engineer for Programs and Project Management, providing SFWMD's scope of work for USACE technical assistance under Support Agreement No. 1 of the MOA. At USACE insistence, the Scope of Work was reduced to only include those tasks for which the USACE clearly understood to be within their authority. The important technical assistance tasks dealing with USACE Vertical Team coordination and review, government to government consultation, and Federal Register notifications were deferred to a future Support Agreement No. 2 pending USACE approval of such technical assistance. This SFWMD letter requested that USACE review each task, along with deliverables and schedule, and provide a USACE cost estimate for each task. This letter also requested that the USACE help the SFWMD meet a target date of approximately mid-November for execution of the MOA and Support Agreement No. 1.
12. November 29, 2017: SFWMD and USACE executed the MOA for Technical Assistance Related to Development of a PACR for the Central Everglades Planning Project.
13. December 1, 2017: SFWMD sent a letter to SAJ Commander COL Jason Kirk submitting a signed version of the Support Agreement No. 1, with cost estimates and schedule, for approval and execution. SFWMD requested execution of Support Agreement No. 1 prior to its December 14 Governing Board meeting, as SFWMD was advancing well into the feasibility study process and had not yet been able to engage the USACE for technical assistance.
14. December 6, 2017: At a Quarterly Executive Team conference call, COL Kirk reported that the USACE full vertical team, including the Office of the ASA(CW), intended to work together to review each task in SFWMD's Scope of Work for Technical Assistance under Section 203, and determine which could be included in the final scope of work for a Support Agreement. It was at this time that USACE put Support Agreement No. 1 on hold, again delaying USACE's technical assistance for SFWMD's ongoing PACR development.
15. December 18, 2017: USACE SAJ communicated via email and attachment the results of the "Full USACE Vertical Team" review of SFWMD's scope of work for requested technical assistance, which concluded that USACE could not directly review and comment on SFWMD work products identified in Support Agreement No. 1. Rather, USACE technical assistance would be limited to an explanation of USACE policy and examples of compliant work products.

Copies of pertinent correspondence can be found in **Appendix C.3.**

7.1.2 Agency Coordination and Public Involvement

The SFWMD held an interagency meeting on November 29, 2017 (webinar) to provide an overview of the CEPP PACR process and inform agencies of the scope, schedule, and progress. This meeting was also noticed. Stakeholders and members of the general public also participated in the meeting. Interagency participation was encouraged to take advantage of technical skills and knowledge of other agencies. Participants included the USEPA, USFWS, United States Geological Survey (USGS), NPS, Miccosukee Tribe of Indians of Florida, Seminole Tribe of Florida, FWC, FDEP and representatives from Okeechobee, Glades, Martin, Palm Beach, Broward, Miami-Dade, and Monroe Counties. A summary of the meeting can be found in **Appendix C.3**.

Public outreach efforts for the CEPP PACR began early in the planning process. Due to public interest in restoration of the south Florida ecosystem, public participation is a critical component of the development of this PACR. Workshops were held at key phases of the planning process during the formulation of project objectives, management measures, and evaluation of alternatives.

Appendix C.3 provides a list of interagency coordination and public presentations conducted throughout the planning process for CEPP. A summary of public participation as required by NEPA is described in **Section 7.1.1** above. Meetings were also held individually with representatives of the Miccosukee Tribe of Indians of Florida and the Seminole Tribe of Florida.

7.1.3 Comments and Responses

A comment response matrix detailing comments received during the scoping process (**Appendix C.3**) and other public comments received during the planning process along with SFWMD responses are included within **Appendix C.3**, which provides a summary of specific concerns raised by stakeholders throughout the planning process. Videos of each of the meetings listed in **Table 7-1** can be viewed at the following link: https://www.sfwmd.gov/our-work/cerp-project-planning/eaa-reservoir.

The PACR, which identified and described the TSP, was subjected to a detailed Technical Review by qualified technical staff members of Federal, State, and local agencies. Technical comments received during the review period were addressed during development of the report. Comment response matrices detailing comments received on the PACR are included in **Annex E**.

7.2 COMPLIANCE WITH ENVIRONMENTAL LAWS, STATUTES AND EXECUTIVE ORDERS

The following table summarizes required compliance with specific Federal acts, Executive Orders, and other applicable environmental laws. **Table 7-2** provides a summary of environmental compliance with each act, E.O., or applicable law. Detailed descriptions indicating the coordination completed to date and the status of any ongoing or compliance issues are located in **Appendix C.4**.

7.3 COMPLIANCE WITH USACE CERP AGRICULTURAL CHEMICAL POLICY

The USACE HTRW policy (ER 1165-2-132) directs that Construction of Civil Works projects in HTRW-contaminated areas should be avoided where practicable. In September 2011, the Assistant Secretary of the Army for Civil Works (ASA(CW)) provided clarification to this HTRW policy for CERP Projects (Memorandum for Deputy Commanding General for Civil and Emergency Operations, Subject: Comprehensive Everglades Restoration Plan (CERP) – Residual Agricultural Chemicals, Dated September 14, 2011). A copy of this policy is included in **Appendix C.4**. If specific criteria are met, this policy memorandum allows residual agrichemicals to remain on project lands and allows the USACE to integrate response actions directly into the construction plan. The SFWMD has requested application of the policy to the A-2 parcel and A-2 Expansion area lands. A copy of the letter from the SFWMD is included in **Annex H**.

The Agricultural Chemical section of **Appendix C.2.2** of the CEPP PACR partially fulfills the requirements established in the aforementioned policy for the A-2 parcel and A-2 Expansion area portion of the CEPP PACR. Pursuant to paragraph 4 of the policy and prior to beginning construction, the Jacksonville District will obtain written documentation of regulatory approval(s) for all response actions from the SFWMD, and enter into an agreement with the SFWMD wherein the USACE accepts and expends funds, contributed by the SFWMD, for performance of the approved response action(s).

An estimated 50% of the cultivated lands within the proposed A-2 Expansion area have not been sampled for residual pesticides consistent with the Comment 2. However, the District contractor has reviewed the historic land use to assess potential regional agrochemical impacts on the property. The review includes an evaluation of crop type, soil laboratory analysis, and start-up sampling for the adjacent A-1 FEB currently in operation. Based on the review as compared to the A-2 Expansion area there are three large sections of property that have not been sampled. These parcels were historically used for sugar cane cultivation. These three parcels have historically been leased to a common lessee. Therefore, chemical application on the District leased lands and property leased from private property owners would reasonably have similar residual agrochemical impacts.

Table 7-2. Compliance with Environmental Laws, Regulations, and Executive Orders: Tentatively Selected Plan

Law, Policy, and Regulations	Status	Comments
Anadromous Fish Conservation Act	In compliance with this Act.	Proposed action would not adversely affect anadromous fish species.
Archaeological Resources Protection Act of 1979	In compliance with this act and will continue to comply throughout construction and operation.	Further investigations may be needed once the project is authorized and the Preconstruction Engineering and Design (PED) has started.
American Indian Religious Freedom Act	In compliance with this Act.	The policy of the U.S. is to protect and preserve for American Indians, Alaska Native Groups and Native Hawaiians, their inherent rights of freedom to believe, express, and exercise traditional religions. These rights include, but are not limited to, access to sites, use and possession of sacred objects, and the freedom to worship through ceremony and traditional rites.
Bald and Golden Eagle Protection Act	In compliance with this Act. A Draft Biological Assessment has been prepared for the PACR, and USACE will initiate ESA Section 7 consultation with USFWS and NMFS after receipt of the PACR by ASA(CW).	Proposed action would not adversely affect the bald eagle. No permits for takes are required.
Clean Air Act of 1972	In compliance with this Act, will obtain any required permits.	Potential for permanent sources of air emissions. Air emissions permit may be required for large diesel pumps.
Clean Water Act of 1972	In compliance with this Act and will obtain a Water Quality Certification (WQC) from the State of Florida and any required National Pollutant Discharge Elimination System (NPDES) permits and will update 404(b) analysis prior to construction.	In accordance with the Clean Water Act, a Section 404(B)(1) Evaluation will be completed and will be contained within **Appendix C.4**. A Comprehensive Everglades Restoration Plan Regulation Act (CERPRA) permit would be sought from the State of Florida for WQC.
Coastal Barrier Resources Act and Coastal Barrier Improvement Act of 1990	The official Coastal Barrier Resources System (CBRS) maps were reviewed and the project does not fall into any designated CBRS areas. These Acts are not applicable to this project.	There are no designated coastal barrier resources in the project area that would be affected by this project.

Table 7-2. Compliance with Environmental Laws, Regulations, and Executive Orders: Tentatively Selected Plan (continued)

Law, Policy, and Regulations	Status	Comments
Coastal Zone Management Act of 1972	In compliance with this Act and obtaining concurrence by the State of Florida. The activity will be in compliance with the Coastal Zone Management Act at the time of construction.	A Florida Coastal Zone Consistency Determination will be prepared in accordance with the provisions of 15 CFR 930 and will be located in **Appendix C.4**. The USACE will make a determination whether the proposed action is consistent to the maximum extent practicable with the enforceable policies of Florida's approved Coastal Zone management program. To ensure the project's continued consistency with the FCMP, concerns identified by the reviewing agencies will be addressed prior to project implementation, and the State's continued concurrence will be based on the activities' continued compliance with FCMP authorities, including Federal and State monitoring of the activities to ensure their continued conformance, and the adequate resolution of issues identified during this and subsequent regulatory review.
Endangered Species Act of 1973	A Draft Biological Assessment has been prepared for the PACR, and USACE will initiate ESA Section 7 consultation with USFWS after receipt of the PACR by ASA(CW).	The purpose of the ESA is to protect and recover imperiled species and the ecosystems upon which they depend. It is administered by the U.S. Fish and Wildlife Service (USFWS) and the Commerce Department's National Marine Fisheries Service (NMFS). The USFWS has primary responsibility for terrestrial and freshwater organisms, while the responsibilities of NMFS are mainly marine wildlife such as whales and anadromous fish. Coordination with the aforementioned agencies is ongoing.
Estuary Protection Act of 1968	In compliance with this Act.	The objectives of the proposed action are focused on environmental protection. The proposed action provides increased opportunities to redirect water that is currently discharged to the Caloosahatchee and St. Lucie Estuaries at undesirable times or in undesirable quantities for flood control purposes, allowing for the re-establishment of oyster and sea grass populations that are important for providing water quality and habitat functions within the Northern Estuaries.
Federal Water Project Recreation Act/Land and Water Conservation Fund Act	In compliance with this Act.	Effects of proposed action on outdoor recreation have been considered in **Section 5.2.15.3** and **Appendix C.2.2.15**. Proposed action would not adversely affect existing recreational opportunities and additional recreational opportunities will likely be realized.

Table 7-2. Compliance with Environmental Laws, Regulations, and Executive Orders: Tentatively Selected Plan (continued)

Law, Policy, and Regulations	Status	Comments
Fish and Wildlife Coordination Act of 1958, as amended.	Compliance is pending.	Upon transmittal of the PACR to ASA(CW), USACE will initiate coordination of the proposed action (TSP) with the USFWS. The Final Fish and Wildlife Coordination Act (FWCA) Report will be included in **Annex A** of the completed and approved report.
Farmland Protection Policy Act of 1981	Full compliance is pending.	Coordination with the U.S. Department of Agriculture, Natural Resources Conservation Service (USDA/NRCS) to meet the requirements of the Farmland Protection Act will be completed subsequent to receipt of the PACR package by the ASA(CW). Refer to **Appendix C.4** for more information.
Magnuson-Stevens Fishery Conservation and Management Act	Compliance is pending.	A Draft Essential Fish Habitat (EFH) assessment has been prepared. USACE will review the Draft EFH assessment upon receipt of the PACR by ASA(CW) and will subsequently coordinate it with the NMFS.
Marine Mammal Protection Act of 1972	Compliance is pending.	Project site and adjacent canals lie outside of the areas mapped as being accessible to Manatees within the USFWS/FWC September 2006 Manatee Accessibility Map. No impacts to marine mammals are anticipated.
Marine Protection, Research and Sanctuaries Act	This Act is not applicable.	The term “dumping” as defined in the Act does not apply to this project. Proposed action does not consider ocean disposal of dredged material.
Migratory Bird Treaty Act of 1918	A Draft Biological Assessment has been prepared for the PACR, and USACE will initiate ESA Section 7 consultation with USFWS after receipt of the PACR by ASA(CW).	Coordination with USFWS is pending.
National Environmental Policy Act of 1969	This document is intended to satisfy all requirements of the National Environmental Policy Act (NEPA) of 1969. Full compliance is pending public review.	NEPA Scoping Meetings were held on 10/23/17 and 10/26/17. Public coordination under NEPA will be initiated subsequent to receipt of the PACR package by ASA(CW).
National Historic Preservation Act of 1966	In compliance with this act and will continue to meet the requirements of it throughout construction and operation.	This act establishing the Advisory Council on Historic Preservation, State Historic Preservation Office, National Register of Historic Places, and the Section 106 review process. The Section 106 Process is further explained and defined in 36 CFR Part 800 and will be part of the project compliance throughout. Further, it will be part of the Federal consultation process with the Tribes.

Table 7-2. Compliance with Environmental Laws, Regulations, and Executive Orders: Tentatively Selected Plan (continued)

Law, Policy, and Regulations	Status	Comments
Native American Graves Protection and Repatriation Act	This Act is applicable since Federal funding was used to purchase the lands within the footprint of the project. In compliance with this act and will continue to meet the requirements of this act throughout construction and operation.	NAPGPRA applies to Native American human remains, funerary objects, sacred objects, and objects of cultural patrimony as defined in the statute and regulations that are: -in Federal possession or control; or –in the possession or control of any institution or State or local government receiving Federal funds; or –excavated intentionally or discovered inadvertently on Federal or Tribal lands.
Resource Conservation and Recovery Act, as Amended by the Hazardous and Soils Waste Amendments of 1984, CERCLA as Amended by the 5.26.21 Superfund Amendments and Reauthorization Act of 1996, Toxic Substances Control Act of 1976.	The SFWMD has completed a limited environmental assessment on the proposed project foot print. Previous and current activities conducted within the proposed project area are in compliance with the referenced acts. The SFWMD will continue to meet the requirements of these acts during the construction and operation.	The District and their contractors will implement procedures during the construction and operation to ensure compliance with the acts' requirements specifically those actives associated with hazardous and toxic chemical documentation, communication, handling, storage and disposal. In the event that any activities or materials that are regulated during the construction or operation of the project are necessary /discovered the District will conduct the appropriate notification and take the necessary actions.
Rivers and Harbors Act of 1899	In compliance with this Act.	Proposed action would not obstruct navigable waters of the United States.
Submerged Lands of 1953	In compliance with the goals of this Act.	The proposed project would reduce damaging freshwater flows to the Caloosahatchee Estuary and the St. Lucie Estuary and will ultimately benefit the ecological habitats that occur on submerged lands of the State of Florida. The proposed project does not occur on submerged lands and no construction is expected on submerged lands.
Wild and Scenic River Act of 1968	This Act is not applicable.	No designated wild and scenic rivers are located within project area.
Executive Order (E.O.) 11514, Protection of the Environment.	In compliance with this E.O.	The objectives of the proposed action are focused on environmental protection.
E.O. 11593 Protection and Enhancement of the Cultural Environment	In compliance with this E.O.	The area of potential effect for cultural resources for this proposed action will include only State and DOI owned lands. Consultation is ongoing to ensure compliance for this E.O.
E.O. 11988 Flood Plain Management	In compliance with this E.O.	Purpose of E.O. is to discourage Federally induced development of floodplains. Commitment of lands to restoration precludes such development.

Table 7-2. Compliance with Environmental Laws, Regulations, and Executive Orders: Tentatively Selected Plan (continued)

Law, Policy, and Regulations	Status	Comments
E.O. 11990 Protection of Wetlands	In compliance with this E.O.	Each Federal agency must provide leadership and take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands. Each agency, to the extent permitted by law, must avoid undertaking or providing assistance for new construction located in wetlands unless the head of the agency finds: there is no practical alternative to such construction; the proposed action includes all practical measures to minimize harm to wetlands that may result from such use. In making this finding the head of the agency may take into account economic, environmental and other pertinent factors (Section 2(a)). Each agency must also provide opportunity for early public review of any plans or proposals for new construction in wetlands (Section 2(b)). .
E.O. 12962, Recreational Fisheries	In compliance with this E.O.	Proposed action is expected to have a beneficial affect with improvements to recreational fisheries in the Caloosahatchee and St. Lucie Estuaries.
E.O. 12898 Environmental Justice	In compliance with this E.O.	The proposed action does not present any environmental impacts that are high, adverse and disproportionate to low income, or minority populations. Sufficient scoping and public participation ensured potential impacts were understood by the public. No comments were presented as possible environmental impacts that may be disproportionate to low income or minority populations.
E.O. 13007 Indian Sacred Sites	This E.O. is not applicable as the project will not involve Federal lands.	This E.O. is directed towards executive branch agencies with statutory or administrative responsibility for the management of Federal lands. The proposed action would not affect Department of Defense owned or USACE-managed lands.
E.O. 13045 Protection of Children	In compliance with this E.O.	Proposed action is not expected to have environmental or safety risks that may disproportionately affect children.
E.O. 13089 Coral Reef Protection	This E.O. is not applicable	Coral reefs are not affected.
E.O. 13122 Invasive Species	In compliance with this E.O.	A nuisance and exotic vegetation control plan has been prepared to prevent or reduce establishment of invasive and non-native species within the project area. Control plan is located in **Annex G**.

Table 7-2. Compliance with Environmental Laws, Regulations, and Executive Orders: Tentatively Selected Plan (continued)

Law, Policy, and Regulations	Status	Comments
E.O. 13175 Consultation and Coordination with Indian Tribal Governments	The USACE will initiate the Government to government consultations after submittal of the CEPP PACR to the ASA(CW), in compliance with this E.O.	Coordination with members and representatives of the Seminole Tribe of Florida and the Miccosukee Tribe of Indians of Florida are ongoing. Pursuant to E.O. 13175, the USACE developed the November 1, 2012 Tribal Policy Memorandum, which dictates Federal responsibilities, including Trust Responsibilities, to Federally recognized Tribes.
E.O. 13186, Responsibilities of Federal Agencies to Protect Migratory Birds	In compliance with this E.O.	The proposed action will meet the requirements of E.O. 13186 including evaluating the effects on migratory birds, with emphasis on species of special concern.
Memorandum on Government to Government Regulations with Native American Tribal Governments	The USACE will initiate the Government to government consultations after submittal of the CEPP PACR to the ASA(CW), in compliance with this Memorandum.	The USACE will consult with the Miccosukee Tribe of Indians of Florida and Seminole Tribe of Florida once the CEPP PACR has been submitted to the ASA(CW).
Seminole Indian Claims Settlement Act of 1987	In compliance with the Act.	This Act also involves an agreement known as the Water Rights Compact, which specifically defines tribal water rights.

For reference, there was no indication that the three parcels, which were not sampled, were used for more intense (pesticide use) agricultural cultivation specifically vegetable or sod. Based on the previous assessment conducted, it is anticipated that some residual concentrations of agrochemicals may be present onsite. Chemical of concerns would include copper, arsenic, and low levels of organochlorine pesticides. It is not anticipated that the concentrations would exceed ecological guidelines on a regional scale. As part of the proposed follow-up assessment, the District will conduct sampling on those areas that were not previously sampled. If impacts are unidentified that pose an unacceptable ecological risk, as determine by the USFWS, corrective action would be implemented to mitigate unacceptable risks. Potential corrective actions could include on-site re-use of impact soils within design feature, i.e., roads, berms, levees, and staging areas. Other corrective actions options include soil inversion, capping impacted areas with clean fill, and offsite relocations of contaminated material. A corrective action plan would be developed and submitted for regulatory concurrence prior to the implementation of these activities.

The A-2 parcel and A-2 Expansion area project features require land conversion from agricultural production to aquatic restoration that inundates the land with water. The avoidance of lands containing residual agricultural chemicals is not practicable. An updated environmental assessment of the TSP project boundary is currently underway. This updated assessment includes a site reconnaissance, updated regulatory database search, and a review of aerial photos of the current project boundary. Additionally, a more comprehensive assessment of the proposed A-2 Expansion area is being conducted. The assessments conducted to date do not include an assessment of approximately 50 percent of the proposed A-2 Expansion area. Upon completion of the updated assessment, a work plan would be submitted to the USFWS and FDEP to assess any point sources and regional impacts that may be identified on the A-2 Expansion area during the assessment update. Upon approval of the work plan, soil and groundwater sample collection and analysis would be conducted. Any necessary soil remediation of point sources and/or regional impacts would be completed as required by the FDEP and USFWS.

Although 50% of the cultivated lands within the proposed A-2 Expansion area have not been sampled for residual pesticides, the District contractor has reviewed the historic land use to assess potential regional agrochemical impacts on the property. The review includes an evaluation of crop type, soil laboratory analysis and start up sampling for the adjacent A-1 FEB currently in operation. Based on the review as compared to the A-2 Expansion area there are three large sections of property that have not been sampled. These parcels were historically used for sugar cane cultivation. These three parcels have historically been leased to a common lessee. Therefore, chemical application on the District leased lands and property leased from private property owners would reasonably have similar residual agrochemical impacts.

For reference, there was no indication that the three parcels, that were not sampled, were used for more intense (pesticide use) agricultural cultivation specifically vegetable or sod. Based on the previous assessment conducted, it is anticipated that some residual concentrations of agrochemicals may be present onsite. Chemical of concerns would include copper, arsenic, and low levels of organochlorine pesticides. It is not anticipated that the concentrations would exceed ecological guidelines on a regional scale. As part of the proposed follow up assessment, the District will conduct sampling on those areas that were not previously sampled. If impacts are unidentified that pose and unacceptable ecological risk, as determine by the USFWS, corrective action would be implemented to mitigate unacceptable risks.

The results of the January and February 2013 assessment indicated that the A-2 parcel 14,408-acre site contains low concentrations of residual copper and other agricultural chemicals. The testing indicated that soils do not exhibit any hazardous waste characteristic under the Resource Conservation and Recovery Act. Based on the sampling, it is reasonable to surmise that the chemical concentrations are indicative of the lawful application of commercially available products intended to enhance agricultural production. The chemicals detected on-site are active ingredients found in commercially available products registered under the Federal Insecticide, Fungicide and Rodenticide Act. The USFWS and FDEP have preliminarily determined that the residual agricultural chemicals found on the A-2 parcel lands do not present a risk to protected resources.

Based on the results of the 2013 soil testing, the USFWS and FDEP are recommending that during the initial operations of the A-2 Reservoir, the SFWMD perform testing of water for several contaminants (2,4-D, atrazine, barium, metribuzin, phorate, dieldrin, chromium, mercury, selenium, copper) as well as testing of periphyton and apple snails for copper. The water quality monitoring plan in **Appendix D** includes a start-up operation sampling event that should be performed at the 30- or 60-day period from inundation, as well as an additional surface water sampling event that should be performed after one year of operations. Upon completion of the updated assessment of the expansion area, a review of the monitoring plan would be conducted. The FDEP and USFWS at this time are not recommending remedial action to address residual agricultural chemicals on the A-2 Expansion area.

The non-Federal sponsor would be 100% responsible for the cost of actions taken due to the presence of residual agricultural chemicals, at no expense to the Federal Government. Any future costs associated with the presence of residual agricultural chemicals at the Federal project site would be 100% non-Federal sponsor cost and responsibility. The costs for characterization of the project lands in preparation for conducting a response action for the residual agricultural chemicals and removal of soils that are hazardous waste would be included as 100% non-Federal sponsor responsibility. The USACE SAJ shall not conduct actions to address residual agricultural chemicals for the SFWMD during the OMRR&R phase of the project.

7.4 COMPLIANCE WITH FLORIDA STATUTES

The State of Florida has enacted several laws pertaining to implementation of CERP projects. These include amendments to Section 373.026 (8) F.S., which establishes a requirement for the SFWMD to submit a State Compliance report pursuant to Section 373.1501 F.S., for review and approval by FDEP prior to formal submission of a request for authorization from Congress and prior to receiving an appropriation of State funds for construction and other implementation activities (except the purchase of lands from willing sellers); the enactment of Section 373.1501 F.S., which establishes the intent of the Florida Legislature with respect to CERP and the criteria for FDEP approval and the procedures to be followed by the SFWMD and FDEP for submitting and reviewing requests for approval; the enactment of Section 373.1502 F.S., which establishes permitting requirements and a process for the submittal, review, and issuance of certain regulatory permits for CERP projects; and the enactment of Section 373.470 and Section 373.472 F.S., establishing the "Save Our Everglades Trust Fund," funding and reporting requirements, and procedures for distributions from the trust fund.

The SFWMD's State Compliance Report addressing the criteria for approval listed in Section 373.1501 F.S. is included in **Annex B**. In addition to the above-described statutory requirements, other sections of

Chapters 373 (Water Resources) and 403 (Environmental Control) of the F.S. include requirements that may apply to various aspects of CERP project planning and implementation. In particular, Chapter 403 F.S. and the administrative laws adopted in accordance with Chapters 373 and 403 F.S., contain the requirements for facilities that involve the discharge or potential discharge of pollutants to surface and groundwaters, and the discharge of air pollutants, including facilities regulated under the Federal Clean Water and Safe Drinking Water Acts and the Federal Clean Air Act.

Chapter 2017-10 Laws of Florida (Section 373.4598 F.S.) directed the SFWMD to work with the USACE to jointly develop a PACR for CEPP to revise the project component located on the CEPP A-2 parcel with the goal of increasing water storage provided by the A-2 project component to a minimum of 240,000 ac-ft, and to explore options for incorporating the A-1 and A-2 parcels into a combined water storage component with no less than 360,000 ac-ft of storage. Section 373.4598 F.S. also authorized water quality features that are required to meet State and Federal water quality standards, and to increases in canal conveyance needed to reduce discharges to the St. Lucie and Caloosahatchee estuaries. Recognizing that an emergency exists regarding high volume freshwater discharges to the St. Lucie and Caloosahatchee estuaries, Section 373.4598 F.S. includes reporting requirements, strict timeframes for achieving key milestones, and requirements related to funding. Section 373.4598 F.S. specifies land acquisition from willing sellers, termination of leases, and prohibits eminent domain. PACR has met all requirements to date.

Based on the information contained in this document, the TSP complies with the applicable provisions of the F.S. A detailed explanation of how the project complies with the applicable requirements for CERP projects contained in the F.S. can be found in **Annex B**.

The Water Resources Law Chapter 2017-10 (Section 373.4598, F.S.) directs the expedited planning, design, and construction of a water storage reservoir in the EAA on the Integrated Delivery Schedule to reduce high-volume discharges to the Northern Estuaries and redirect flow to the Greater Everglades. The law directs the SFWMD to meet certain expedited timelines for implementing the project by preparing a PACR to the authorized CEPP Plan. Senate Bill 10 directed the SFWMD to perform several tasks regarding the Everglades Agricultural Area (EAA) Storage Reservoir with the ultimate goal of reducing harmful discharges to the coastal estuaries, improving flow to the Everglades and achieving State water quality standards.

7.4.1 Permits, Entitlements, and Certifications

The SFWMD will need to obtain a Section 404 Clean Water Act Permit prior to being allowed to perform work in jurisdictional wetlands, or within other Waters of the United States. The decision to issue the required permit will be based on their public interest review which will include coordination with other Federal agencies such as USFWS, NMFS, SHPO, and the Tribes. Although much of the project area will likely be determined to be jurisdictional, most of the area has been severely degraded by past farming activities, and the area currently serves to provide limited wetland functions and values. Despite the limited functions and values being provided, the project will have to demonstrate avoidance, minimization, and mitigation for any project-related functional wetland losses.

The SFWMD will also need to obtain a State Water Quality Certification and Coastal Zone Consistency Determination, both of which are prerequisites to issuance of the Section 404 Permit, and both of which will be included within the Comprehensive Everglades Restoration Program Regulation Act (CERPRA) Permit, which will be issued under 373.1502 F.S.

The proposed TSP would not substantially impact or modify the existing A-1 FEB located adjacent to the project's eastern boundary. However, some minor modifications to the A-1 FEB Everglades Forever Act Permit (EFA Permit No. 0313994) may be needed to address operational changes or connecting structures with the TSP. In addition, prior to construction, the contractor will need to obtain coverage under the Generic Permit for Stormwater Discharge from Large and Small Construction activities pursuant to Chapter 62-621.300 (4) F.A.C. from the FDEP and also any Consumptive Use permits for temporary construction dewatering activities.

All required Federal and State permits and/or modifications to existing permits would be acquired prior to construction activities.

7.4.2 Compliance with Applicable Water Quality Standards and Permitting Requirements

The TSP is anticipated to improve water quality within the Northern Estuaries by reducing the magnitude, frequency, and severity associated with releases to these estuaries. Associated reductions in the frequency and/or rate of backflow to Lake Okeechobee should result in minor water quality improvements to the Lake, including reductions in the 2008 EPA Total Maximum Daily Load (TMDL) Waste Load Allocation for Lake Okeechobee inflow sub-basins.

Construction and operation of the A-2 Reservoir, with the A-2 STA, and conveyance improvements is predicted to maintain compliance with State water quality standards, specifically the WQBEL for Everglades STA. Although completion of all project components should lower the flow weighted mean total phosphorus concentrations entering the ENP, it is slightly less clear how increased flow to Shark River Slough would affect compliance with Appendix A of the Everglades Settlement Agreement/Consent Decree. In light of this uncertainty, the Technical Oversight Committee is currently reviewing applicability of the current Appendix A compliance methodology for a restored ecosystem. With respect to the Loxahatchee and Taylor Slough, relative to the FWO, no change to Settlement Agreement compliance is anticipated.

Any short-term impacts to water quality associated with construction of the TSP would be ameliorated by construction sequencing, implementation of Best Management Practices for erosion and sedimentation control, and monitoring during construction. Longer-term impacts to water quality associated with the operation of project features would be addressed through operational monitoring and adaptive management actions.

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8.0 SFWMD RECOMMENDATIONS AND REQUEST FOR ASA (CW) REVIEW, APPROVAL, AND TRANSMITTAL TO CONGRESS FOR AUTHORIZATION

The CEPP, as authorized in section 1401(4) of the WIIN Act of 2016, will redirect a portion damaging high-volume discharges of freshwater currently flowing from Lake Okeechobee into the Northern Estuaries (Caloosahatchee and St. Lucie Estuaries) and deliver this water southward to the central Everglades. As authorized, the increased flows would be directed through a FEB and STAs within the EAA, prior to ultimate delivery of this water to WCA 3, ENP, and Florida Bay. Reducing high discharges to the Northern Estuaries will improve salinity and turbidity conditions and benefit seagrass beds and the animals that inhabit them. The environmentally beneficial releases from Lake Okeechobee to WCA 3, ENP, and Florida Bay will restore a more natural mosaic of habitat conditions in these areas by improving the quantity, quality, timing, and distribution of flows to the central Everglades system.

The CEPP includes increments of several components of the CERP approved by Congress as the framework for Everglades restoration and the authorized CEPP plan represents a first increment of restoration in the central Everglades system. Implementation of this plan is expected to be adaptively managed and sequenced in implementation phases that include the construction of logical groupings of CEPP features that are compatible with other CERP and non-CERP components.

The overall CEPP plan is integral to achieving restoration in the central Everglades and plays an important role in meeting CERP system-wide ecosystem goals and objectives. The project will enhance more than 1.5 million acres of freshwater and estuarine habitats in Palm Beach, Broward, Miami-Dade, Monroe, Martin, and Lee Counties. CEPP, as authorized, would deliver an average of approximately 210,000 ac-ft per year of additional water from Lake Okeechobee to the central Everglades, or approximately two-thirds of the CERP flows.

This CEPP PACR proposes modifications to the Federally authorized CEPP plan to include a storage reservoir in the EAA with larger capacity than the currently authorized A-2 FEB, an additional stormwater treatment feature, and improved canal conveyance features between Lake Okeechobee and the new reservoir. These modifications to CEPP would further decrease the high volume damaging regulatory releases from Lake Okeechobee to the Northern Estuaries and provide for a total delivery of “new water” to the central Everglades to an average of approximately 370,000 ac-ft per year, essential to Everglades Restoration. A complete description of the proposed modifications to the CEPP plan is presented in **Section 6** of this report entitled “Tentatively Selected Plan.” This PACR was prepared under authority granted in Section 203 of WRDA 1986, as amended, and in accordance with ER 1105-2-100, ER 1165-2-209, other pertinent USACE guidance, and other pertinent laws, regulations, and Executive Orders.

8.1 RECOMMENDED MODIFICATIONS TO PROVISIONS IN THE CHIEF OF ENGINEERS REPORT FOR THE CENTRAL EVERGLADES PLANNING PROJECT

During preparation of the CEPP PACR, the SFWMD reviewed the report of the Chief of Engineers on CEPP, dated December 23, 2014, to ensure pertinent provisions and conditions were considered and accounted for in development of the proposed post authorization change. CEPP, as modified by this PACR, would not result in appreciable changes to most of the provisions and conditions in the Chief of Engineers report, as they would continue to apply to the overall CEPP plan regardless of implementation of the TSP addressing increased storage in the EAA. However, the proposed modification to CEPP may necessitate revisions in certain provisions and conditions in the Chief of Engineers report, and the recommendations of the SFWMD in that regard are presented in the following paragraphs. Two of the key provisions addressed in the recommendations are (1) Federal cost sharing for the proposed new A-2 STA and (2) changes to cost sharing of OMRR&R costs for Federal use of state facilities. Federal cost sharing for the proposed new A-2 STA is addressed in detail in **Section 8.2**. Proposed changes to cost sharing of OMRR&R costs for Federal use of state facilities is addressed in more detail in **Section 8.3**. The SFWMD recommends that the following modifications to specific provisions in the Chief of Engineers report for CEPP be incorporated into the Assistant Secretary's Report on the CEPP PACR to be submitted to the Committee on Environment and Public Works of the United States Senate and the Committee on Transportation and Infrastructure of the United States House of Representatives for action by the United States Congress.

8.1.1 Chief of Engineers Report, Paragraph 1.

The SFWMD does not have recommended modifications to Paragraph 1.

8.1.2 Chief of Engineers Report, Paragraph 2.

The SFWMD does not have recommended modifications to Paragraph 2.

8.1.3 Chief of Engineers Report, Paragraph 3.

Paragraph 3 addresses the project goals and benefits. The SFWMD recommends that the provisions of paragraph 3 be replaced by the following:

> 3. The CEPP PACR recommends a project that contributes significantly to the ecological goals and objectives of CERP: (1) increasing the spatial extent of natural areas; (2) improving habitat function and quality; and (3) improving native plant and animal abundance and diversity. The historical Everglades ecosystem was previously defined by a mosaic of uplands, freshwater marsh, deep water sloughs, and estuarine habitats that supported a diverse community of fish and wildlife. Today nearly all aspects of South Florida's flora and fauna have been affected by development, altered hydrology, nutrient input, and spread of non-native species that have resulted directly or indirectly from a century of water management for human needs. The CEPP PACR confirms information in the CERP and provides a conceptual plan that evaluated the costs and benefits associated with construction and operation of the Central Everglades components of the CERP. The CEPP PACR will help restore the central portion of the Everglades ecosystem towards a state more similar to the historic conditions. The project will improve habitat function and quality, native plant and animal abundance, and species composition and diversity by advancing towards the CERP goal in reducing damaging discharges to the northern estuaries and by delivering the CERP Goal of approximately 370,000 average annual acre feet of additional water to the Everglades.

8.1.4 Chief of Engineers Report, Paragraph 4.

Paragraph 4 identifies project features. No changes to Paragraph 4, or subparagraphs 4.b., 4.c., 4.d., and 4.e. are recommended. The SFWMD recommends that the provisions of paragraph 4.a. be replaced by the following;

a. The A-2 Reservoir includes a 10,500-acre reservoir and 6,500-acre STA with associated distribution, inlet, and outlet structures. The project also includes 1,000 cfs of additional conveyance capacity in the Miami Canal within the EAA and 200 cfs of additional conveyance capacity in the North New River Canal within the EAA. These features will work in conjunction with the existing 60,000 ac-ft A-1 FEB, STA-2, and STA-3/4 to deliver new water south.

8.1.5 Chief of Engineers Report, Paragraph 5.

Paragraph 5 addresses project cost-share. The SFWMD recommends that the provisions of paragraph 5 be replaced by the following;

5. The total project first cost of the CEPP features, as modified by the CEPP PACR, based upon 2018 price levels, is estimated to be $3,174,000,000 rounded to the nearest $1 million. This includes an estimated cost of $1,288,000,000 for the CEPP features that remain part of the project and an estimated cost of $1,883,000,000 for the CEPP PACR features. The project first cost for the ecosystem restoration features is estimated to be $3,164,000,000 and for recreation is estimated to be $10,000,000. In accordance with the cost-sharing requirements of Section 601 (e) of WRDA 2000, construction costs for ecosystem restoration are shared 50-50 between the government and non-federal sponsor. Construction costs associated with recreation features are also cost-shared 50-50 in accordance with Section 103 of WRDA 1986, as amended. Additionally, the government is responsible for 100% of cultural resources data recovery costs, up to 1% of total project costs. Therefore, in consideration of estimated costs for cultural resources data recovery, the federal cost of the CEPP features, as modified by the CEPP PACR, would be $1,587,915,000 and the non-federal cost would be $1,586,085,000. The estimated lands, easements, right-of-way, and relocation (LERRs) costs for the tentatively selected plan are $61,000,000, of which approximately $34,000,000 are creditable to the government and approximately $27,000,000 are creditable to the non-federal sponsor. Federal funds contributed by Department of Interior (DOI) pursuant to Section 390 of the Federal Agriculture Improvement and Reform Act of 1996 (Public Law 104- 127, 110 Stat. 1022) are credited to the federal share of the project cost pursuant to Section 601 (e)(3) of WRDA 2000. DOI contributed approximately $34,000,000 toward the purchase of the lands associated with the A-2 Reservoir and A-2 STA.

8.1.6 Chief of Engineers Report, Paragraph 6.

The SFWMD does not have recommended modifications to Paragraph 6.

8.1.7 Chief of Engineers Report, Paragraph 7.

Paragraph 7 addresses the estimated project costs annualized over the 50-year period of economic evaluation. The SFWMD recommends that the provisions of paragraph 7 be replaced by the following;

7. Based on 2018 price levels, a 50-year period of economic evaluation and a 2.75 percent discount rate, the equivalent annual cost for ecosystem restoration features of the proposed CEPP project as modified by the CEPP PACR is estimated at $143,104,000, which includes OMRR&R, interest during construction and amortization. The estimated annual costs for restoration OMRR&R are $13,743,000, of which $4,760,000 is attributed to new CEPP infrastructure; $5,629,000 to flowing water through existing state and C&SF infrastructure; and $3,354,000 to invasive species

management. Post construction monitoring will occur during 10-year cycles for invasive species and performance-based ecological monitoring ($151,000 annually for up to 10 years). Permit-related monitoring and monitoring that informs project operations will also be conducted ($2,897,000 annually) and this monitoring will be assessed periodically and revised as needed. The OMRR&R costs for recreation features are estimated at $68,000 and are a 100% non-federal responsibility.

8.1.8 Chief of Engineers Report, Paragraph 8.

The SFWMD does not have recommended modifications to Paragraph 8.

8.1.9 Chief of Engineers Report, Paragraph 9.

Paragraph 9 addresses the use of state of Florida facilities constructed and operated pursuant to state permits. No changes to the first paragraph of Paragraph 9, or subparagraphs a. and d. are recommended. The SFWMD recommends that the provisions of subparagraphs b., c. and e. be replaced by the following:

b. The state facilities and C&SF features will use excess capacity to process "new water" provided by CEPP features, as modified by the PACR, which has been estimated to comprise approximately (1) 27.3% of the total water volume that could flow through these facilities associated with the use of STA 3/4 and STA-2, and (2) an additional 21.3% of the total water volume (for a total of 48.6%) that could flow through these facilities associated with the use of the new A-2 STA. OMRR&R costs are assumed to be linear with flow volumes and thus the additional increase in OMRR&R costs due to the increased flow volumes will be 27.3% and 48.6%, respectively, of the total OMRR&R costs for use of facilities associated with flow through STA 3/4 and STA-2 and with flow through the new A-2 STA. Consistent with the general CERP authorization for cost sharing OMRR&R (WRDA 2000 Section 601 (e)(4)), CEPP, as modified by the PACR, should be authorized to contribute 27.3% and 48.6%, respectively of the OMRR&R costs of the aforementioned state facilities and C&SF features to the extent that OMRR&R activities are directly related to their use for treating "new water". The federal pro-rated share for OMRR&R for the facilities used by CEPP, as modified by the PACR, is therefore (1) 50% of 27.3%, or 13.65% of the total OMRR&R costs for those facilities associated with the use of STA 3/4 and STA-2, and (2) 50% of 48.6%, or 24.3% of the total OMRR&R costs for those facilities associated with the use of the new A-2 STA.

c. The project authorization should include specific statutory language allowing the government to provide 50% cost share for 27.3% of the yearly OMRR&R costs of state facilities and listed C&SF features with appropriations made available for OMRR&R activities for CEPP, as modified by the PACR, associated with the use of STA 3/4 and STA 2. The project authorization should include specific statutory language allowing the government to provide 50% cost share for 48.6% of the yearly OMRR&R costs of state facilities and listed C&SF features with appropriations made available for CERP OMRR&R activities associated with the use of the new A-2 STA. The term "OMRR&R costs" is defined the same as the term "project OMRR&R costs" in Article I.E. of the Master Agreement between the Department of the Army and the non-federal sponsor dated 13 August 2009. Following the same procedures set forth in Section 6.6.2 of the 2014 CEPP PIR, approval by USACE Headquarters and the Assistant Secretary of the Army (Civil Works) is required prior to commencing replacement and rehabilitation actions for the state facilities listed previously that CEPP, as modified by the PACR, is dependent on. This is a condition of the federal cost share.

e. Due to the simplified assumptions used for determining cost-share of the OMRR&R, an adaptive management construct will be developed that prescribes processes and procedures for determining a more accurate allocation of costs once more detailed information is available regarding the impact of CEPP, as modified by the PACR, on the OMRR&R of existing state facilities and C&SF features. After CEPP, as modified by the PACR, has operated for an appropriate period, an analysis based on monitoring data will be undertaken to evaluate project performance and verify that the project successfully delivers an annual average of approximately 370,000 acre-feet of new water for the natural system as described in the CEPP PACR.

(1) If the monitoring data and analysis show that CEPP produces less than the anticipated 370,000 acre-feet per year on average, then the Federal project is not fully realizing the projected benefits and the state facilities and C&SF features are not being burdened as projected. In such a case, the analysis will be used to inform changes in operations to achieve the quantity, timing or distribution of water as described in this PIR/EIS, or recommend changes to the amount of water to be reserved or allocated to the natural system.

(2) If the monitoring data and analysis show that CEPP actually processes significantly more or less than the anticipated 370,000 acre-feet per year of "new water" on average, then the analysis may be used to adjust the calculation of OMRR&R cost share upward or downward to reflect the actual average annual use of excess capacity by the federal project. This will be accomplished through consultation with the state and USACE Headquarters and is necessary after operations have begun to capture the true federal interest and cost share responsibility.

8.1.10 Chief of Engineers Report, Paragraph 10.

Paragraph 10 addresses non-CEPP projects, sequencing of CEPP implementation, and the three PPAs for CEPP implementation. The SFWMD recommends that the provisions of paragraph 10 be replaced by the following:

10. A number of non-CEPP projects must be in place before implementing most CEPP features and certain non-CEPP projects must be integrated into the sequencing of CEPP implementation to avoid unintended adverse consequences. All features of the State Restoration Strategies must be completed and meet state water quality standards prior to operating most CEPP project features. Implementation of CEPP will occur over many years, and the project be constructed in three phases that are considered separable elements with inter-related project features grouped to provide incremental hydrologic and ecological benefits. The three implementation phases are based upon developing three Project Partnership Agreements (PPAs) and are identified as PPA North, PPA South, and PPA New Water. The CEPP PACR features are grouped into three separate PPAs based upon the spatial distribution of the features and the locations within the CEPP study area. The features included in each are identified in the CEPP project, as modified by the CEPP PACR. These groupings include a PPA to cover project features in northern WCA 3A (PPA North),

a PPA to cover project features in southern WCA 3A, 3B and ENP (PPA South), and a PPA to cover the new water storage A-2 Reservoir, A-2 STA treatment, improved conveyance on the NNR and Miami Canal and seepage management features (PPA New Water). Implementation of the CEPP PACR will occur over many years and include many actions by the USACE and SFWMD. These actions may include executing PPAs in parallel and construction of the CEPP PACR features in parallel to advance completion of project components as funding becomes available and as quickly as possible to achieve ecosystem benefits. The phased implementation approach incorporates an adaptive implementation process and recommendations of the National Research Council, maximizing the opportunity to realize incremental restoration benefits by initially building features that utilize existing water in the system that meets state water quality standards. Individual PPAs, or amendments to existing PPAs, will be executed prior to construction of each implementation phase. The project dependencies include:

a. A-1 FEB and State Restoration Strategies: Required prior to operation of northern WCA-3A distribution features (L-4 degrade, new pump station, S-8 Modifications, L-5 and L-6 improvements, Miami Canal Backfilling) to ensure adequate water quality treatment of inflows;

b. 8.5 Square Mile Area (SMA) and Existing S-356: Construction of the C-358 seepage collector canal and structure S-357N within the 8.5 SMA must be completed to allow full utilization of the 8.5 SMA features to provide seepage mitigation for increasing flows into Northeast Shark River Slough (NESRS); operation of the existing S-356 pump station (500 cfs) is required prior to significantly increasing flows to NESRS, to provide seepage management;

c. C-111 South Dade: Extension of the detention area levees to connect with 8.5 SMA is required prior to significantly increasing flows to NESRS to enable operation of the S-357 pump station to provide seepage management to 8.5 SMA;

d. Modified Water Deliveries (MWD) to ENP 1-Mile Bridge and Road Raising: The MWD project will be complete and operational prior to implementation of WCA-3B inflow structures along the L-67 A&C levees, apart from S-152 that is already constructed and in testing phase, to ensure adequate road protection to allow for increased stages in L-29 canal;

e. Broward County Water Preserve Area (BCWPA) C-11 lmpoundment: Required implementation of additional WCA-3B inflow structures along the L-67 A&C levees, apart from S-152 that is already constructed and in testing phase, to ensure adequate water quality of inflows to WCA 3B and NESRS;

f. Tamiami Trail Next Steps Bridging and Road Raising: Required prior to increasing capacities of S-356 and implementation of WCA-3B inflow structures along the L-67A levee, gaps in L-67C levee, apart from S-152 that is already constructed and in testing phase, and Blue Shanty flowway (L-67C removal, L-29 levee removal);

g. Indian River Lagoon (IRL) South C-44 Reservoir and Connection to C-23 Canal: Required prior to re-directing the maximum amount of water from Lake Okeechobee south to the A-2 Reservoir to meet environmental performance, to avoid reduction in low flows to the St. Lucie Estuary and low Lake Okeechobee water levels that affect the Lake Okeechobee Service Area (LOSA);

h. Modification to the Lake Okeechobee Regulation Schedule (LORS) is anticipated prior to full utilization of the A-2 Reservoir, A-2 STA and improved canal conveyance in order to achieve the complete ecological benefits envisioned for the northern Estuaries and through redirecting the full 370,000 acre-feet per year on average south to be provided by CEPP, as modified by the PACR, and to avoid low lake levels that would affect the LOSA.

8.1.11 Chief of Engineers Report, Paragraph 11.

Paragraph 11 addresses efficiency of the ecosystem restoration plan. No changes to paragraph 11 and 11.b. are recommended. The SFWMD recommends that the provisions of paragraph 11.a. be replaced by the following:

a. The recommended plan benefits more than 1.5 million acres in the Caloosahatchee and St. Lucie Estuaries, WCA-3A, WCA-3B, ENP, and Florida Bay. The benefits to approximately 994,000 acres in WCA-3A, WCA-3B and ENP are derived by increasing the quantity of freshwater inflow to the natural system by 76% and improving sheetflow through the system. This will improve the depths, duration, and movement of water that will help to restore and sustain the ridge and slough landscape. Reducing high volume freshwater discharges from Lake Okeechobee to the Caloosahatchee and St. Lucie Estuaries by 55% and 40% (respectively), improves approximately 86,000 acres in these estuaries by reducing turbidity, sedimentation, and moderating unnatural fluctuations in salinity that are extremely detrimental to estuarine communities. The increase in the quantity and improved timing of freshwater to the Everglades will bring the benefits as described above, and then when the water reaches Florida Bay at the southern end of the system it will reduce the intensity, frequency, and duration of hypersaline events in the Bay across approximately 476,000 acres. An average salinity decrease of 0.5 parts per thousand will help to re-establish a persistent and resilient estuarine zone that extends further into the bay.

8.1.12 Chief of Engineers Report, Paragraph 12.

The SFWMD does not have recommended modifications to Paragraph 12.

8.1.13 Chief of Engineers Report, Paragraph 13.

The SFWMD does not have recommended modifications to Paragraph 13.

8.1.14 Chief of Engineers Report, Paragraph 14.

The SFWMD does not have recommended modifications to Paragraph 14.

8.1.15 Chief of Engineers Report, Paragraph 15.

Paragraph 15 addresses management of residual risks and uncertainties associated with project implementation. The SFWMD recommends that the provisions of paragraph 15 be replaced with the following:

15. Due to the risks and uncertainties associated with CEPP PACR, the long implementation time, and dependencies on other CERP and non-CERP projects, many risk management measures have been developed to ensure future coordination with USACE Headquarters and, as needed, the Office of the Assistant Secretary of the Army (Civil Works). Additional project information and decision documentation reports, if needed, will be developed to support each of the three PPAs by providing more detailed information and documenting significantly changed conditions if they

exist. Significant changes in project scope or cost from the CEPP PACR may warrant a Limited Reevaluation Report (LRR) or General Reevaluation Report (GRR) in lieu of other supporting project information and decision documentation.

a. Jacksonville District will provide an annual status report to South Atlantic Division and USACE Headquarters and will conduct a briefing that addresses overall project progress and key uncertainties and/or decisions required as implementation progresses. It will include an update on implementation of CEPP PACR features and those non-CEPP projects on which the CEPP PACR is dependent.

b. Jacksonville District will coordinate with South Atlantic Division and USACE Headquarters to develop an adaptive management strategy regarding cost share of OMRR&R of State facilities and C&SF features (see paragraph 9.)e).

c. Jacksonville District will provide to the South Atlantic Division and USACE Headquarters: draft biological opinions pursuant to ESA for review and approval; notification of development of additional NEPA documents; and Jacksonville District will coordinate during planning, engineering and design phase the definition of activities at state facilities as either repair, replacement or rehabilitation actions.

d. If applicable, Jacksonville District will coordinate and obtain approval from USACE Headquarters: for the government to cost share OMRR&R of additional state facilities and C&SF features not identified in the CEPP PACR; for the government to cost share replacement and rehabilitation actions at state facilities; for any changes to the three CEPP PACR implementation phases; to determine appropriate course of action should state water quality compliance not be met after construction and operation of CEPP PACR; and, to use less than a fee estate, including any permits or other instruments obtained for real estate interests other than the provision of fee property for the project, except for the temporary construction easements and the borrow easements, which are approved.

8.1.16 Chief of Engineers Report, Paragraph 16.

Paragraph 16 addresses review of the CEPP Project Implementation Report. No changes are recommended to paragraph 16.a, 16.b.(1) and 16.c. The SFWMD recommends that the provisions of paragraphs 16.b.(2) and 16.b.(3) be replaced by the following:

b. (2) The PACR indicates that completion of the A-1 FEB through the State of Florida's Restoration Strategies project is required prior to operation of the CEPP northern WCA-3A distribution features to ensure adequate water quality treatment of inflows. Additionally, the full benefits of the CEPP PACR PPA New Water phase are dependent on some features in PPA North and PPA South phases. The CEPP PACR features are grouped into three separate PPAs based upon the spatial distribution of the features and the locations within the CEPP study area. Implementation of the CEPP PACR will occur over many years and include many actions by the USACE and SFWMD. These actions may include executing PPAs in parallel and construction of the CEPP PACR features in parallel to advance completion of project components as funding becomes available and as quickly as possible to achieve ecosystem benefits.

b. (3) The CEPP PACR recognizes risks and uncertainties and prior to implementation of each phase of the project, additional detailed information pertaining to that phase will be developed. This additional detailed information will be utilized and updated as appropriate as revisions are made to Water Control Plans and Project Operating Manuals for each phase. The USACE will ensure that all legal requirements are met for each phase and compliance will be maintained throughout the entirety of CEPP implementation.

8.1.17 Chief of Engineers Report, Paragraph 17 through 20.

The SFWMD does not have recommended modifications to Paragraphs 17 through 20.

8.2 COST SHARING OF NEW WATER QUALITY TREATMENT FEATURE

Section 528(e)(2) of WRDA 1996 (P.L. 104-303) provides that the non-Federal share of the costs of features for water quality improvement shall be 100% unless: The Secretary of the Army determines that a project feature to improve water quality is essential to Everglades restoration then the cost share for the feature shall be 50%, provided it is not part of the Everglades Construction Project. Subsequent to the passage of WRDA 1996, the USACE adopted guidance for implementing Section 528(e)(2) of WRDA 1996 (Water Quality Policy for South Florida Ecosystem Restoration, 7 Nov. 1997, CECW-AG by the Director of Civil Works). This policy states that in order to qualify for Federal cost sharing, CERP features providing water quality improvement must be designated as (1) water reclamation; or (2) water reuse projects. Water reclamation is defined as diverting water formerly discharged to tide or otherwise disposed to increase the volume of water available for the Everglades ecosystem restoration. Water reuse is defined as modifying the use of water from its present function (e.g., flood control) in a current location to a preferred function (e.g., hydrologic restoration) in a preferred location.

For the purpose of analyzing Federal participation in the water quality features, the FWO condition was developed based on the assumption that the non-Federal interests will meet the requirements of the Clean Water Act and State water quality standards for existing flows (both runoff and additional Lake Okeechobee flows). The FWO condition assumes BMPs and all reasonable measures within the EAA are in place to assure that the waters being received by the C&SF Project system are of sufficient quality to meet published standards. Since additional flows are determined essential for Everglades restoration, additional water quality features were formulated and included in the TSP.

The water quality feature (STA) included as part of the CEPP PACR TSP is a water reclamation feature (as defined in the guidance stated above). Water that was originally discharged for flood control or used for water supply purposes require treatment prior to being used for ecosystem restoration. For example, the runoff that is presently discharged to the Northern Estuaries would be detained in the EAA water storage reservoir. The water stored in the EAA reservoir will be treated and released as “new water” to the Greater Everglades for ecosystem restoration. The “new water” provided by the TSP is essential to Everglades Restoration and water quality features are essential to achieve restoration of the Everglades ecosystem. Accordingly, the new water quality treatment feature in the TSP will be subject to 50% Federal cost sharing.

8.3 OPERATIONS, MAINTENANCE, REPAIR, REPLACEMENT, AND REHABILITATION OF EXISTING STATE FACILITIES USED BY CEPP, INCLUDING PROPOSED CEPP MODIFICATIONS

The authorized CEPP plan requires the use of several State facilities constructed and operated pursuant to State permits. The non-Federal sponsor is responsible for OMRR&R of their State Restoration Strategies and Everglades Construction Project facilities. The facilities are necessary for the State to meet water quality requirements as approved by the USEPA, and as litigated by the U.S. Department of Justice. Some of these requirements are currently subject to a Settlement Agreement filed with and overseen by the Federal District Court (*United States v. South Florida Water Management District*, Case No. 88-1886-CIV-Moreno (S.D. Fl. 1988)). These features are a part of the Everglades Construction Project. Certain of those State facilities are to be used by CEPP until such time as CEPP is deauthorized or it is determined use of the State facilities is no longer necessary for the purpose of achieving CEPP project purposes.

The CEPP, as authorized for implementation by Section 1401(4) of the WIIN Act of 2016, provides for Federal cost sharing of the OMRR&R for State facilities where their operation is required to ensure that new water for Everglades restoration made available by CEPP meets water quality standards and achieves CEPP project benefits. All features required for the State's Restoration Strategies and the Everglades Construction Project are independent State facilities and are not considered or incorporated as components or features of the Federally authorized CEPP plan. These facilities include: (1) STA-2; (2) STA-3/4; (3) FEB A-1; (4) G-357 Gated Culvert; (5) G-370 Pump Station; (6) G-371 Gated Spillway; (7) G-372 Pump Station; (8) G-404 Pump Station; (9) G-434 Pump Station; (10) G-435 Pump Station; (11) S-6 Pump Station; (12) S-7 Pump Station; (13) S-8 Pump Station; and (14) S-150 Gated Culverts, and their corresponding remote-control facilities.

The State would retain sole responsibility for performing operations activities at State facilities within the area covered by the CEPP plan pursuant to the State Operations Plan, with the exception of the FEB A-1 which would be integrated with the new EAA storage reservoir and treatment facilities proposed in this PACR (in lieu of the currently authorized A-2 FEB) and operated pursuant to a mutually agreed upon water control manual. The joint water control manual for the combined storage and treatment facilities would integrate the operation of CEPP and the operation of the State facilities used by CEPP. Pursuant to the Item of Local Cooperation paragraph (f), the State has agreed that the USACE shall have the opportunity to collaborate, review, and comment on the OMRR&R of the State facilities used by CEPP, including updates to optimize operations to achieve Federal project purposes. This is intended to ensure continuous achievement of CEPP project purposes and support the Federal interest in cost sharing the OMRR&R. To the extent applicable, any operational modifications to the State facilities that would potentially impair the function and/or authorized purposes of any USACE project, including all features of the CEPP plan (as modified by the CEPP PACR) as well as other CERP and C&SF project features, may require a 33 USC Section 408 review and concurrence from the USACE.

The aforementioned State facilities would use excess capacity to process "new water" provided by CEPP, which was estimated in the CEPP PIR to increase flows approximately 23.5% above the existing flows through these facilities. In the CEPP PIR, OMRR&R costs were assumed to be linear with flow volumes and were therefore expected to increase the OMRR&R costs for the State facilities to be used under CEPP by 23.5%. The USACE pro-rated share for OMRR&R for the State facilities to be used under the currently authorized CEPP plan would be 50% of the 23.5% increase, or 11.75% of the total OMRR&R costs for these facilities. Cost sharing for OMRR&R of State facilities for the CEPP PACR is discussed in more detail in **Sections 6.4.2.2 and 6.6.2**.

The increase in "new water" that would result from the proposed modifications presented in this CEPP PACR would increase the share of the total water volume expected to flow through these facilities. Because a portion of this water will now be treated by the new A-2 STA, as proposed in the TSP, two cost increases are identified: (1) for flow routed through State-Owned/State-Operated treatment facilities (STA2 and STA 3/4), and (2) for flow routed through the A-2 STA. The increase to the total water volume expected to flow through State-Owned/State-Operated STAs is 27.3%. The increase to the total water volume expected to flow through State-Owned/State Operated facilities directly related to inflows and outflows through the A-2 STA is an additional 21.3% beyond the 27.3% increase to State-Owned/State Operated STAs or a total of 48.6%. Therefore, the Congressional authorization for the proposed modifications to CEPP, as presented in this CEPP PACR, authorize Federal cost share of the OMRR&R costs of the aforementioned State facilities for their role in treating "new water" for Everglades restoration. The Federal share of those increased OMRR&R costs would be 50% of 27.3%, or 13.65%, for those facilities (as identified in **Table 6-11**) receiving flows routed through State-Owned/State-Operated STAs. The Federal share of those increased OMRR&R costs would be 50% of 48.6%, or 24.3%, for those facilities (as identified in **Table 6-11**) receiving flows routed through the new A-2 STA.

The term "OMRR&R costs" is defined the same as the term "project OMRR&R costs" in Article I.E. of the Master Agreement between the Department of the Army and the non-Federal sponsor dated August 13, 2009. As a condition of the USACE cost share, prior to commencing replacement and rehabilitation actions for the State facilities listed above that CEPP, as modified by the TSP, is dependent on, approval by HQUSACE and the ASA (CW) is required. **Section 6.6.2** describes the coordination and approval process.

Pursuant to Section 601(h)(4) of WRDA 2000, the non-Federal sponsor is required to execute a water reservation or allocation of water identified in each CERP PIR for the natural system[1]. The Operating Manual associated with each CERP Project Implementation Report shall "reflect the operational criteria used in the identification of the appropriate quantity, timing, and distribution of water dedicated and managed for the natural system."[2] Pursuant to the Programmatic Regulations, USACE and the SFWMD shall periodically update, as appropriate, the estimated total quantity of water expected to be generated for the natural system and for use in the human environment "based on new information resulting from changed or unforeseen circumstances, new or scientific or technical information, new or updated models, or information developed through the adaptive assessment principles contained in the Plan, or future authorized changes to the Plan integrated into the implementation of the Plan."[3] Furthermore, the Programmatic Regulations require that the PIR "include a plan for operations of the project in the event that the project fails to provide the quantity, timing, or distribution of water described in the PIR."[4] For

[1] According to 33 CFR 385.27(b) "The Project Cooperation Agreement shall include a finding that the South Florida Water Management District or the Florida Department of Environmental Protection has executed under State law the reservation or allocation of water for the natural system as identified in the Project Implementation Report." This finding shall be verified by the District Engineer prior to executing the Project Cooperation Agreement (PCA).
[2] 33 CFR §385.28(a)(6)(vi).
[3] 33 CFR §385.35(b).
[4] 33 CFR §385.35(c).

this CEPP PACR, the above requirements would equally apply to the CEPP plan as modified by the PACR, upon authorization by Congress.

After CEPP, as modified by the TSP, has operated for an appropriate period of time, an analysis based on monitoring data shall be undertaken to evaluate project performance and verify that the project successfully delivers an annual average of approximately 370,000 ac-ft of new water for the natural system as described in this PACR. If the monitoring data and analysis show that TSP actually produces less than the anticipated amount of new water on average, then the Federal project is not fully realizing the projected benefits and the State facilities are not being burdened as projected. In such a case, the analysis will be used to inform changes in operations in order to achieve the quantity, timing, or distribution of water as described in this CEPP PACR, or recommend changes to the amount of water to be reserved or allocated to the natural system. Additionally, if the monitoring data and analysis show the TSP actually processes significantly more or less than the anticipated "new water" on average, then the analysis may be used to adjust the calculation of OMRR&R cost share upward or downward to reflect the actual average annual use of excess capacity by the Federal project. Any recommended adjustments to the OMRR&R cost share calculation may require additional Congressional approval and legislation. This will be accomplished through consultation with the State and USACE Headquarters and is necessary after operations have begun to capture the true Federal interest and cost share responsibility. Additionally, it must be recognized and the adjustment made given State facilities are subject to legal requirements outside of the Federal project and will not be operated in such a manner that the Federal project will cause exceedances of the State's water quality requirements under State NPDES and EPA permits and associated Consent Orders. Such State requirements may limit the anticipated Federal project benefits.

No cost share of the aforementioned State facilities shall commence before the date that the CEPP plan, as modified under the CEPP PACR, produces "new water," construction of the Federal project is declared complete, and the State assumes its OMRR&R responsibilities as established in the appropriate project partnership agreements. Similarly, no cost share for State facilities is allowed until construction of the State facilities are shown to be complete and the State begins regular operation of such facility.

Some CEPP and non-CEPP projects must be in place before implementing CEPP features, including those recommended in this CEPP PACR, and certain non-CEPP projects must be integrated into the sequencing of CEPP implementation as shown in **Table 6-21** in **Section 6** in order to avoid unintended adverse consequences. For example, all features of the State's Restoration Strategies will be completed by December 31, 2025, and meet State water quality standards prior to initiating construction of most CEPP project features.

Implementation of CEPP, including the proposed modifications included herein, are currently identified in the IDS to occur over many years. The plan is composed of implementation phases that include an authorized feature or logical groupings of authorized features, agreed upon by the USACE and SFWMD, that maximize benefits to the extent practicable consistent with project dependencies and the Adaptive Management and Monitoring Plan (see **Annex D**). Each implementation phase will achieve incremental hydrologic and environmental benefits. The phased implementation approach incorporates the adaptive management process, maximizing the opportunity to realize incremental restoration benefits by initially building features that utilize existing water in the system that meets State water quality standards. Individual project partnership agreements, or amendments to existing project partnership agreements, will be executed prior to construction for each implementation phase.

8.4 ITEMS OF LOCAL COOPERATION

The proposed modifications to the CEPP plan in this PACR would not change the items of local cooperation that were identified in the CEPP PIR. The non-Federal sponsor and the Secretary of the Army shall enter into binding project partnership agreements defining the terms and conditions of cooperation for implementing the project, and that the non-Federal sponsor agrees to perform the following items of local cooperation:

a. Provide 50% of total project costs consistent with the provisions of Section 601(e) of WRDA 2000, as amended, including authority to perform design and construction of project features consistent with Federal law and regulation;
b. Provide all lands, easements, and rights-of-way, including suitable borrow and dredged or excavated material disposal areas, and perform or assure the performance of all relocations that the Government and the non-Federal sponsor jointly determine to be necessary for the construction, operation, maintenance, repair, replacement and rehabilitation of the project and valuation will be in accordance with the Master Agreement;
c. Shall not use the ecosystem restoration features or lands, easements, and rights-of way required for such features as a wetlands bank or mitigation credit for any other non-CERP projects;
d. Give the Government a right to enter, at reasonable times and in a reasonable manner, upon land that the non-Federal sponsor owns or controls for access to the project for the purpose of inspection, and, if necessary, for the purpose of constructing, completing, operating, maintaining, repairing, replacing, or rehabilitating the project;
e. Assume responsibility for OMRR&R of the project or completed functional portions of the project, including mitigation features, in a manner compatible with the project's authorized purposes and in accordance with applicable Federal and State laws and specific directions prescribed in the OMRR&R manuals and any subsequent amendments thereto. Cost sharing for OMRR&R will be in accordance with Section 601(e) of WRDA 2000, as amended. Notwithstanding Section 528(e)(3) of WRDA 1996 (110 stat. 3770), the non-Federal sponsor shall be responsible for 50% of the cost of OMRR&R activities authorized under this section;
f. The State shall provide USACE an opportunity to collaborate, review and comment on the State Operations Plans for the State facilities used by CEPP, including updates to optimize operations for Federal project purposes.
g. The non-Federal sponsor shall operate, maintain, repair, replace and rehabilitate the recreational features of the project and is responsible for 100%of the cost;
h. Keep the recreation features, and access roads, parking areas, and other associated public use facilities, open and available to all on equal terms;
i. Unless otherwise provided for in the statutory authorization for this project, comply with Section 221 of Public Law 91-611, Flood Control Act of 1970, as amended, and Section 103 of the WRDA of 1986, Public Law 99-662, as amended, which provides that the Secretary of the Army shall not commence the construction of any water resources project or separable element thereof, until the non-Federal sponsor has entered into a written agreement to furnish its required cooperation for the project or separable element;
j. Hold and save the Government free from all damages arising from construction, operation, maintenance, repair, replacement and rehabilitation of the project and any project-related

betterments, except for damages due to the fault or negligence of the Government or the Government's contractors;

k. Keep and maintain books, records, documents, and other evidence pertaining to costs and expenses incurred pursuant to the project to the extent and in such detail as will properly reflect total project costs in accordance with the Master Agreement between the Department of the Army and the non-Federal sponsor dated August 13, 2009, including Article XI Maintenance of Records and Audit;

l. Perform, or cause to be performed, any investigations for hazardous substances that are determined necessary to identify the existence and extent of any hazardous substances regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. 9601-9675, that may exist in, on, or under lands, easements or rights-of-way necessary for the construction, operation, and maintenance of the project; except that the non-Federal sponsor shall not perform such investigations on lands, easements, or rights-of-way that the Government determines to be subject to the navigation servitude without prior specific written direction by the Government;

m. Assume complete financial responsibility for all necessary cleanup and response costs of any CERCLA regulated materials located in, on, or under lands, easements, or rights-of-ways that the Government determines necessary for construction, operation, maintenance, repair, replacement and rehabilitation;

n. As between the Government and the non-Federal sponsor, the non-Federal sponsor shall be considered the operator of the project for purposes of CERCLA liability. To the maximum extent practicable, the non-Federal sponsor shall operate, maintain, repair, replace, and rehabilitate the project in a manner that will not cause liability to arise under CERCLA;

o. Prevent obstruction of or encroachments on the project (including prescribing and enforcing regulations to prevent such obstructions or encroachments) such as any new developments on project lands, easements, and rights-of-way or the addition of facilities which might reduce the outputs produced by the ecosystem restoration features, hinder operation and maintenance of the project, or interfere with the project's proper function;

p. Comply with the applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, P.L. 91-646, as amended by title IV of the Surface Transportation and Uniform Relocation Assistance Act of 1987 (P.L. 100-17), and the Uniform Regulations contained in 49 CFR part 24, in acquiring lands, easements, and rights-of-way, and performing relocations for construction, operation, and maintenance of the project, and inform all affected persons of applicable benefits, policies, and procedures in connection with said act;

q. Comply with all applicable Federal and State laws and regulations, including, but not limited to, Section 601 of the Civil Rights Act of 1964, P.L. 88-352 (42 U.S.C. 2000d) and Department of Defense Directive 5500.11 issued pursuant thereto; Army Regulation 600-7, entitled "Nondiscrimination on the Basis of Handicap in Programs and Activities Assisted or Conducted by the Department of the Army;" and all applicable Federal labor standards requirements including, but not limited to, 40 U.S.C. 3141-3148 and 40 U.S.C. 3701-3708 [revising, codifying and enacting without substantive change the provisions of the Davis-Bacon Act (formerly 40 U.S.C. 276a et seq.), the Contract Work Hours and Safety Standards Act (formerly 40 U.S.C. 327 et seq.) and the Copeland Anti-Kickback Act (formerly 40 U.S.C. 276c)];

r. Comply with Section 106 of the National Historic Preservation Act in completion of all consultation with the Florida State Historic Preservation Officer, and other interested parties including Federally recognized Tribes and as necessary, the Advisory Council on Historic Preservation, prior to construction as part of the preconstruction engineering and design phase of the project;

s. Provide 50% of that portion of total data recovery activities associated with historic preservation that exceed one percent of the amount authorized to be appropriated for CEPP; data recovery costs under one percent of the authorized CEPP cost will be funded in its entirety by the Government. Any costs of data recovery that exceed one percent of the amount authorized to be appropriated for CEPP shall not be included in project construction costs or project OMRR&R costs (as defined by the Master Agreement); therefore, credit shall not be afforded to the non-Federal sponsor for costs or work in kind associated with data recovery activities that exceed one percent of the amount authorized to be appropriated for CEPP;

t. Do not use Federal funds to meet the non-Federal sponsor’s share of total project costs unless the Federal granting agency verifies in writing that the expenditure of such funds is expressly authorized and in accordance with Section 601 (e)(3) of the WRDA of 2000, as amended, and in accordance with the Master Agreement;

u. The non-Federal sponsor agrees to participate in and comply with applicable Federal floodplain management and flood insurance programs consistent with its statutory authority:

   1. Not less than once each year the non-Federal sponsor shall inform affected interests of the extent of protection afforded by the project;

   2. The non-Federal sponsor shall publicize flood plain information in the area concerned and shall provide this information to zoning and other regulatory agencies for their use in preventing unwise future development in the flood plain and in adopting such regulations as may be necessary to prevent unwise future development and to ensure compatibility with protection levels provided by the project;

   3. The non-Federal sponsor shall comply with Section 402 of WRDA 1986, as amended (33 U.S.C. 701b-12), which requires a non-Federal interest to have prepared, within one year after the date of signing a project partnership agreement for the project, a floodplain management plan. The plan shall be designed to reduce the impacts of future flood events in the project area, including but not limited to, addressing those measures to be undertaken by non-Federal interests to preserve the level of flood protection provided by the project. As required by Section 402, as amended, the non-Federal interest shall implement such plan not later than one year after completion of construction of the project. The non-Federal sponsor shall provide an information copy of the plan to the Government upon its preparation;

   4. The non-Federal sponsor shall prescribe and enforce regulations to prevent obstruction of or encroachment on the project or on the lands, easements, and rights-of-way determined by the Government to be required for the construction, operation, maintenance, repair, replacement, and rehabilitation of the project, that could reduce the level of protection the project affords, hinder operation or maintenance of the project, or interfere with the project’s proper function.

v. The non-Federal sponsor shall execute, or certify that FDEP executed, under State law the reservation or allocation of water for the natural system as identified in the PIR for this authorized

CERP project as required by Section 601(h)(4)(B)(ii) of WRDA 2000 and the non-Federal sponsor shall provide information to the Government regarding such execution. In compliance with 33 CFR 385, the District Engineer will verify such reservation or allocation in writing. Any change to such reservation or allocation of water shall require an amendment to the project partnership agreement after the District Engineer verifies in writing in compliance with 33 CFR 385 that the revised reservation or allocation continues to provide for an appropriate quantity, timing, and distribution of water dedicated and managed for the natural system after considering any changed circumstances or new information since completion of the PIR for the authorized CERP project.

w. Consistent with the September 14, 2011 Memorandum from Jo-Ellen Darcy, ASA (CW) the non-Federal sponsor shall be 100% responsible for the cost of all actions taken due to the presence of residual agricultural chemicals, at no expense to the Federal Government and any future costs associated with the presence of residual agricultural chemicals at the Federal project site are 100% a non-Federal sponsor cost and responsibility. As stated in the September 14, 2011 memorandum, normal project engineering and construction activities will remain part of the total project cost provided that these are the same activities required to implement the project features absent the presence of residual agricultural chemicals.

8.5 WATER QUALITY

In addition to the aforementioned items of local cooperation, the United States Army and the State of Florida agreed to specific concepts regarding water quality, as presented in the CEPP PIR, which are intended to govern the implementation and operation of CEPP project features. The proposed modifications to CEPP included in this PACR would not preclude or change these water quality–related concepts, which are repeated from the CEPP PIR as follows:

> *Restoration of the Everglades requires projects that address hydrologic restoration as well as water quality improvement. This has been recognized by the National Academy of Sciences in its most recent biennial report where it noted that near-term progress to address both water quality and water quantity improvements in the central Everglades is needed to prevent further declines of the ecosystem. The significant amount of water resulting from CEPP is contemplated to significantly improve restoration of the Everglades. Both the Federal and State parties recognize that water quantity and quality restoration should be pursued concurrently and have collaborated to develop and concur on a suite of restoration strategies being implemented by the State to improve water quality ("State Restoration Strategies"), as well as other State and Federal restoration projects, both underway and planned, to best achieve Everglades hydrologic objectives. Specific examples of Federally authorized projects include the Everglades Restoration Transition Plan, Modified Water Deliveries to Everglades National Park Project, and the Tamiami Trail Next Steps Project.*[5] *One of the goals of these projects and their associated operating plans, as well as certain components of the CERP awaiting authorization or that are being planned as part of the CEPP is to improve water quantity and quality in the Everglades through more natural water flow within the remnant Everglades which includes the water conservation areas and ENP. Variations in flows of the C&SF system may result from a variety of reasons. These reasons include*

[5] The next phase of bridging for Tamiami Trail roadway as authorized by Congress.

natural phenomena (e.g., weather) and updates to the operating manuals to achieve the purposes of the C&SF Project such as flood control and water supply.

One goal of the Consent Decree[6] is to restore and maintain water quality within ENP. The Consent Decree established, among other things, long-term water quality limits for water entering ENP to achieve this goal. The existing limits for ENP are flow dependent and, generally, increased volume of water results in a lower allowable concentration of phosphorus to maintain the overall load of phosphorus entering the ENP. There will be redistribution of flows and increased water volume above existing flows associated with system restoration efforts beyond the current State Restoration Strategies projects. The USACE and its Federal and State partners recognize that to achieve long-term hydrologic improvement, water quality may be impacted, particularly as measured by the current Consent Decree Appendix A compliance methodology. The USACE and the State partners agree that the monitoring locations/stations for inflows to ENP will require revision. An evaluation of this and other aspects of the compliance methodology are currently being conducted by the Technical Oversight Committee (TOC).

In an effort to address these potential impacts and determine updates to [Consent Decree] Appendix A to reflect increased inflows and new discharges into ENP since the Consent Decree was entered, the parties to the Consent Decree have established a process and scope for evaluating and identifying necessary revisions to the Appendix A compliance methodology utilizing the scientific expertise of the TOC. The TOC may consider all relevant data, including the 20 years of data collected since Appendix A was implemented. Ultimately, such evaluations and changes to the Appendix A compliance methodology would be recommended by the Consent Decree's TOC for potential agreement by all parties. Failure to develop a mutually agreed upon and scientifically supportable revised compliance methodology will impact the State's ability to implement or approve these projects.

The aforementioned State Restoration Strategies will be implemented under a Clean Water Act discharge permit that incorporates and requires implementation of corrective actions required under a State law Consent Order, as well as a Framework Agreement between the U.S. Environmental Protection Agency and the State discharge permitting agency, the Florida Department of Environmental Protection, to ensure compliance with Clean Water Act and State water quality requirements for existing flows into the Everglades. The Clean Water Act permit for the State facilities, the associated Consent Order (including a detailed schedule for the planning, design, construction, and operation of the new project features), and technical support documents were reviewed by, and addressed all of, the U.S. Environmental Protection Agency's previous objections related to the draft National Pollutant Discharge Elimination System ("NPDES") permits, prior to issuance.

All parties are committed to implementing the State Restoration Strategies, joint restoration projects, and associated operational plans, in an adaptive manner that is consistent with the objectives of the underlying C&SF Project. The USACE and the State will use all available relevant data and supporting information to inform operational planning and decision making, document

[6] *United States v. South Florida Water Management District, et al.*, Case No. 88-1886-CIV-Moreno (U.S.D.C., S.D. Fla.).

decisions made, and evaluate the resulting information from those decisions to avoid adverse impacts to water quality where practicable and consistent with the purposes of the C&SF Project. Based upon current and best available technical information, the Federal parties believe at this time that the State Restoration Strategies, implemented in accordance with the State issued Consent Order and other joint restoration projects, are sufficient and anticipated to achieve water quality requirements for existing flows to the Everglades. If there is an exceedance of the Appendix A compliance limits, which results from a change in operation of a Federal project, and it has been determined that an exceedance cannot be remedied without additional water quality measures, the Federal and State partners agree to meet to determine the most appropriate course of action, including what joint measures should be undertaken as a matter of shared responsibility. These discussions will include whether it is appropriate to exercise any applicable cost share authority. If additional measures are required and mutually agreed upon, then they shall be implemented in accordance with an approved process, such as a general reevaluation report or limited reevaluation report, and if necessary, supported through individual project partnership agreements. Failure to develop mutually agreed upon measures and cost share for these measures may impact the State's ability to operate the Federal project features.

8.6 REQUEST FOR ASA (CW) REVIEW, APPROVAL, AND TRANSMITTAL TO CONGRESS FOR AUTHORIZATION

This report requesting a proposed post authorization change to the Federally authorized CEPP plan is hereby submitted by the SFWMD for review and approval by the ASA (CW) and subsequent transmittal to Congress for authorization in accordance with Section 203 of WRDA 1986, as amended. The total estimated first cost for the CEPP, as modified by the CEPP PACR TSP, is $3,174,000,000 (FY 2018 price level), with an estimated Federal cost of $1,587,915,000 and an estimated non-Federal cost of $1,586,085,000 (**Section 6, Table 6-19**). The project first cost includes recreation features totaling $10,000,000. The average annual cost of the recreation features is $437,800 and the average annual benefits are $1,214,400, resulting in net benefits of $776,700 and a 2.77 to 1 benefit to cost ratio. The estimated total annual cost of OMRR&R for the ecosystem restoration elements is $13,743,000 with an estimated Federal annual OMRR&R cost of $6,871,500 and an estimated non-Federal OMRR&R cost of $6,871,500. Average annual monitoring costs, which include both 10-year cycle costs amortized over the period of analysis and the annual cost of longer-term monitoring requirements, totals $6,236,000. The estimated Federal cost is $3,118,000 and the non-Federal cost is $3,118,000 (**Section 6**, **Table 6-19**). The estimated cost for OMRR&R of the recreation elements is $68,000, which is 100% non-Federal responsibility.

9.0 LIST OF REPORT PREPARERS

This section provides a list of persons involved in the preparation and review of this document (**Table 9-1**).

Table 9-1. List of CEPP PACR Report Preparers and Reviewers

Name	Organization	Discipline/Expertise	Role in Document Preparation
Mike Albert	SFWMD	Project Management	Project Management Team
Jeremy Ashton	SFWMD	Social Media	Media
Dennis Barnett	J-Tech	Civil Engineer	Project Management Team
Susan Bennett	SFWMD	Creative Services	Media
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Luis Cadavid	SFWMD	Engineer	Engineering Reviewer/Operations
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10.0 GLOSSARY OF ACRONYMS AND TERMS

10.1 LIST OF ACRONYMS

A	
ac-ft	acre-feet
AM	Adaptive Management
ASA(CW)	Assistant Secretary of the Army for Civil Works
B	
BBCW	Biscayne Bay Coastal Wetlands
BCWPA	Broward County Water Preserve Areas
BMAP	Basin Management Action Plan
BMP	Best Management Practices
BO	Biological Opinion
C	
C&SF	Central and Southern Florida
CBRS	Coastal Barrier Resources System
CE	Caloosahatchee Estuary
CE/ICA	Cost Effectiveness and Incremental Cost Analysis
CEM	Conceptual Ecological Model
CEPP	Central Everglades Planning Project
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERP	Comprehensive Everglades Restoration Plan
CERPRA	Comprehensive Everglades Restoration Plan Regulation Act
cfs	cubic feet per second
CO_2	carbon dioxide
COP	Combined Operating Plan
CRE	Caloosahatchee River Estuary
CSSS	Cape Sable seaside sparrow
CWA	Clean Water Act
D	
Decomp	Decompartmentalization and Sheetflow Enhancement project
DEIS	Draft Environmental Impact Statement
DMSTA	Dynamic Model for Stormwater Treatment Areas

DSAC	Dam Safety Action Classification
DOI	Department of Interior
DPOM	Draft Project Operating Manual
DSAC	Dam Safety Action Classification
DSMS	Dam Safety Modification Study
E	
EAA	Everglades Agricultural Area
EC	Engineering Circular
ECB	Existing Conditions Baseline
EDC	engineering during construction
EFA	Everglades Forever Act
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
ENP	Everglades National Park
E.O.	Executive Order
EQ	Environmental Quality
ER	Engineering Regulation
EPA	Everglades Protection Area
ERTP	Everglades Restoration Transition Plan
ESA	Endangered Species Act
EWMA	Everglades Wildlife Management Area
F	
F.A.C.	Florida Administrative Code
FAR	Florida Administrative Register
FB-EC	Florida Bay East Coast
FDEP	Florida Department of Environmental Protection
FEB	Flow Equalization Basin
F.S.	Federal Statute
FS/DEIS	Feasibility Study/Draft Environmental Impact Statement
ft	feet
FWC	Florida Fish and Wildlife Conservation Commission
FWCA	Fish and Wildlife Coordination Act
FWO	Future Without (Project Condition)

FY	Fiscal Year
G	
GDM	General Design Memorandum
GRR	General Reevaluation Report
H	
HHD	Herbert Hoover Dike
HQUSACE	USACE Headquarters
HTRW	Hazardous, Toxic and Radioactive Waste
HU	habitat unit
I	
IDC	interest during construction
IEPR	Independent External Peer Review
IG	Interim Goal
IOP	Interim Operations Plan
IR	Indicator Region
IRL	Indian River Lagoon
IRL-S	Indian River Lagoon-South (Project)
IWR	Institute for Water Resources
J	
K	
L	
LEC	Lower East Coast
LECSA	Lower East Coast Service Area
LERR	Lands, Easements, Rights of Way, and Relocations
LNWR	Loxahatchee National Wildlife Refuge
LOOPS	Lake Okeechobee Operations Screening
LORS	Lake Okeechobee Regulation Schedule
LOSA	Lake Okeechobee Service Area
LOWRP	Lake Okeechobee Watershed Restoration Project
LRR	Limited Reevaluation Report
LTGM	Long-Term Geometric Mean
M	
M&I	Municipal and Industrial

MCRAM	Monte Carlo Reservoir Analysis Model
µg/L	micrograms per liter
mg/L	milligrams per liter
MGD	million gallons per day
MISP	Master Implementation Sequencing Plan
Mo.	Month
MOA	Memorandum of Agreement
MP	Monitoring Plan
MSL	Mean Sea Level
MWD	Modified Water Deliveries
N	
NED	National Economic Development
NEPA	National Environmental Policy Act
NER	National Ecosystem Restoration
NESRS	Northeast Shark River Slough
NFSL	normal full storage (elevation) level
NGVD	National Geodetic Vertical Datum
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NNR	North New River
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRHP	National Register of Historic Places
NRC	National Research Council
NRCS	Natural Resources Conservation Service
O	
OIWW	Okeechobee Intercoastal Waterway
O&M	Operations and Maintenance
OMRR&R	Operations, Maintenance, Repair, Rehabilitation, and Replacement
OTMP	Operational Testing and Monitoring Period
P	
PACR	Post Authorization Change Report
PCA	Project Cooperation Agreement

PDT	Project Delivery Team
PED	Preconstruction Engineering and Design
PET	Potential Evapotranspiration
PIR	Project Implementation Report
P.L.	Public Law
PM	Performance Measure
POR	Period of Record
PPA	Project Partnership Agreement
ppb	parts per billion
PPCA	Pre-Partnership Credit Agreement
psu	practical salinity unit
PWS	Public Water Supply
Q	
R	
RDO	Rain Driven Operations
RECOVER	REstoration COordination and VERification
RED	Regional Economic Development
RESOPS	Reservoir Sizing Operations Screening Model
ROM	rough order of magnitude
RPM	reasonable and prudent measure
RSM	Regional Simulation Model
RSM-BN	Regional Simulation Model for Basins
RSM-GL	Regional Simulation Model for the Glades and Lower East Coast Service Area
S	
S&A	supervision and administration
SAD	South Atlantic Division (USACE)
SAJ	Jacksonville District (USACE)
SAV	submerged aquatic vegetation
SDCS	South Dade Conveyance System
SFWMD	South Florida Water Management District
SFWMM	South Florida Water Management Model
SHPO	State Historic Preservation Office(er)
SLE	St. Lucie Estuary

SLR	Sea Level Rise
SMA	Square Mile Area
SPF	Standard Project Flood
SRS	Shark River Slough
STA	stormwater treatment area
T	
TC	terms and conditions
THPO	Tribal Historic Preservation Office(er)
TMDL	Total Maximum Daily Limit
TOC	Technical Oversight Committee
TP	Total Phosphorus
TSP	Tentatively Selected Plan
TTNS	Tamiami Trail Modifications Next Steps
U	
U.S.	United States
USACE	United States Army Corps of Engineers
U.S.C.	United States Code
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
V	
W	
WCA	Water Conservation Area
WERP	Western Everglades Restoration Project
WIIN Act	Water Infrastructure Investments for the Nation Act of 2016
WPA	Water Preserve Areas
WPB	West Palm Beach
WQBELs	Water Quality-Based Effluent Limits
WQC	Water Quality Certification
WRAC	Water Resources Advisory Coalition
WRDA	Water Resources Development Act
WRRDA	Water Resources Reform and Development Act

WSE	Water Supply and Environmental Regulation Schedule

X

Y

Z

10.2 GLOSSARY OF TERMS

A

Acre — Area of land equal to 43,560 square feet. In the S.I. metric system, one acre is equal to 4,046.9 square meters or 2.471 hectares.

Acre-foot — The quantity of water required to cover 1 acre to a depth of 1 foot. Equal to 43,560 cubic feet (1,233.5 cubic meters).

Action Plan — A plan that describes what needs to be done and when it needs to be completed.

Activity — A specific project task that requires resources and time to complete.

Adaptive Management — A process for learning and incorporating new information into the planning and evaluation phases of the restoration program. This process ensures that the scientific information produced for this effort is converted into products that are continuously used in management decision-making.

Adverse Effect – In relation to historic properties, an adverse effect is found when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the NRHP in a manner that will diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association.

Adverse Impact — The detrimental effect of an environmental change relative to desired or baseline conditions.

Affected Environment — Existing biological, physical, social, and economic conditions of an area subject to change, both directly and indirectly, as a result of a proposed human action.

Air Quality — Measure of the health-related and visual characteristics of the air, often derived from quantitative measurements of the concentrations of specific injurious or contaminating substances.

Aquatic — Consisting of, relating to or being in water; living or growing in, on or near the water; or taking place in or on the water.

Aquifer — An underground geologic formation, a bed or layer of earth, gravel or porous stone, that yields water or in which water can be stored.

Authorization — An act by the Congress of the United States, which authorizes use of public funds to carry out a prescribed action.

B

Baseline — The initial approved plan for schedule, cost or performance management, plus or minus approved changes, to which deviations will be compared as the project proceeds.

Benthic — Bottom of rivers, lakes, or oceans; organisms that live on the bottom of water bodies.

Best Management Practices — The best available land, industrial and waste management techniques or processes that reduce pollutant loading from land use or industry, or which optimize water use.

Biological Opinion — Document issued under the authority of the Endangered Species Act stating the U.S. Fish and Wildlife Service and/or the National Marine Fisheries Services finding as to whether a Federal action is likely to jeopardize the continued existence of a threatened or endangered species or result in the destruction or adverse modification of critical habitat.

Borrow Canal — Canal or ditches where material excavated is used for earthen construction nearby. Also, typically denotes a canal with no conveyance or water routing purpose.

C

Canal — A human-made waterway that is used for draining or irrigating land or for navigation by boat.

Candidate Species — Plant or animal species not yet officially listed as threatened or endangered, but which is undergoing status review by the U.S. Fish and Wildlife Service or the National Marine Fisheries Service.

Central and Southern Florida Project (C&SF) — A multi-purpose project, first authorized by Congress in 1948, which provides flood control, water supply protection, water quality protection and natural resource protection.

Channel — Natural or artificial watercourse, with a definite bed and banks to confine and conduct continuously or periodically flowing water.

Coastal Ridge — Area of land bordering the coast whose topography is elevated higher than land further inland.

Comprehensive Everglades Restoration Plan (CERP) — The plan for the restoration of the greater Everglades and to meet water supply and flood protection needs in the urban and agricultural regions of south Florida.

Control Structure — A human-created structure that regulates the flow of waters or the level of waters.

Conveyance Capacity — The rate at which water can be transported by a canal, aqueduct, or ditch. In this document, conveyance capacity is generally measured in cubic feet per second (cfs).

Cost-Benefit Analysis — An analysis, often stated as a ratio, used to evaluate a proposed course of action.

Critical Habitat — A description, which may be contained in a Biological Opinion, of the specific areas with physical or biological features essential to the conservation of a listed species and which may require special management considerations or protection; these areas have been legally designated via Federal Register notices.

Cubic feet per second (cfs) — A measure of the volume rate of water movement. As a rate of streamflow, a cubic foot of water passing a reference section in 1 second of time. One cubic foot per second equals 0.0283 meter /second (7.48 gallons per minute). One cubic foot per second flowing for 24 hours produces approximately 2 acre-feet.

Cultural Resources – Encompasses both culturally significant sites and historic properties.

Culturally Significant Site – Are geographically defined areas supporting current or past human use such as a community meeting area, spiritual sites, places of worship, medicinal plant gathering areas or cemeteries and burial sites.

Culvert — A concrete, metal or plastic pipe that transports water.

D

Discharge — The rate of water movement as volume per unit time, usually expressed as cubic feet per second.

Dissolved Oxygen (D.O.) — The concentration of oxygen dissolved in water, sometimes expressed as percent saturation, where saturation is the maximum amount of oxygen that theoretically can be dissolved in water at a given altitude and temperature.

Dry Season — Hydrologically, for south Florida, the months associated with a lower incident of rainfall, typically November through May.

Duration — The period of time over which a task occurs, in contrast to effort, which is the amount of labor hours a task requires; duration establishes the schedule for a project, and effort establishes the labor costs.

E

Ecology — The science of the relationships between organisms and their environments, also called bionomics; or the relationship between organisms and their environment.

Ecosystem — A functional group of animal and plant species that operate in a unique setting that is mostly self-contained.

Effectiveness — A measure of the quality of attainment in meeting objectives; this is distinguished from efficiency, which is measured by the volume of output achieved for the input used.

Endangered Species — Any species or subspecies of bird, mammal, fish, amphibian, reptile, or plant which is in serious danger of becoming extinct throughout all, or a significant portion of its range. Federally endangered species are officially designated by the U.S. Fish and Wildlife Service or the National Marine Fisheries Service and published in the Federal Register.

Enhancement — Measures which develop or improve the quality or quantity of existing conditions or resources beyond a condition or level that would have occurred without an action; i.e., beyond compensation.

Environmental and Economic Equity (EEE) — A program-level activity, referred to in early phases of the program as Socioeconomic and Environmental Justice.

Environmental Consequences — The impacts to the Affected Environment that are expected from implementation of a given alternative.

Environmental Impact Statement (EIS) — An analysis required by the National Environmental Policy Act for all major Federal actions, which evaluates the environmental risks of alternative actions.

Estuary — A water passage where the tide meets a river current; an arm of the sea at the lower end of a river.

Eutrophic — Referring to a body of water which is naturally or artificially enriched in dissolved nutrients, and often shallow with a seasonal deficiency in dissolved oxygen due to high primary production.

Evaluate — To appraise or determine the value of information, options or resources being provided to a project.

Evaporation — The change of a substance from the solid or liquid phase to the gaseous (vapor) phase.

Evapotranspiration — Evapotranspiration is part of they hydrologic cycle that is a combination of evaporation and transpiration. Solar energy induces evaporation, causing water vapor to condense and fall as precipitation. A portion of the precipitation seeps into the ground and is consumed by plants. It is then recycled back into the atmosphere in the form of transpiration.

Exotic species — Introduced species not native to the place where they are found.

F

Fallowed Land — Cultivated land that lies idle during a growing season.

Feasibility Study — The second phase of a project. The purpose is to describe and evaluate alternative plans and fully describe recommended project.

Federally Endangered Species — An endangered species which is officially designated by the U.S. Fish and Wildlife Service or the National Marine Fisheries Service and published in the Federal Register.

Flood Control Storage Capacity — Reservoir capacity reserved for the purpose of regulating flood inflows to reduce flood damage downstream [compare with reservoir storage capacity].

Flow — The volume of water passing a given point per unit of time.

Flow Equalization Basin – Constructed storage feature that is operated between 0 - 4 feet above ground surface used to capture and temporarily store peak stormwater flows

Instream Flow Requirements — Amount of water flowing through a stream course needed to sustain instream values.

Minimum Flow — Lowest flow in a specified period of time.

Peak Flow — Maximum instantaneous flow in a specified period of time.

G

Geospatial Data — Information, which includes, but is not limited to surveys, maps, aerial photography, aerial imagery, and biological, ecological and hydrological modeling coverages.

Goal — Something to be achieved. Goals can be established for outcomes (results) or outputs (efforts).

Groundwater — Water stored underground in pore spaces between rocks and in other alluvial materials and in fractures of hard rock occurring in the saturated zone.

Groundwater Level — Refers to the water level in a well, and is defined as a measure of the hydraulic head in the aquifer system.

Groundwater Pumping — Quantity of water extracted from groundwater storage.

Groundwater Seepage — Groundwater flow in response to a hydraulic gradient.

Groundwater Table — The upper surface of the zone of saturation, except where the surface is formed by an impermeable body.

H

Habitat — Area where a plant or animal lives.

Hammock — Localized, thick stands of trees that can grow on natural rises of only a few inches in the land.

Hectare — A unit of measure in the metric system equal to 10,000 square meters or 2.47 acres.

Historic Properties – Encompasses archaeological, traditional, and built environment resources, including but not limited to buildings, structures, objects, districts and sites over 50 years of age.

Hydraulic Gradient — Denotes slope of watercourse, above or below ground water level. Typically, defines energy loss or consumption in the conveyance process.

Hydraulic Head (Lift) — Denotes relative comparison of water stages for gravity flow. Pump stations generally provide lift or increase water level elevations.

Hydrologic Condition — The state of an area pertaining to the amount and form of water present. For example, saturated ground (water table at surface), lake stage and river flow rate.

Hydrologic Response — An observed decrease or increase of water in a particular area.

Hydrology — The scientific study of the properties, distribution and effects of water on the earth's surface, in the soil and underlying rocks, and in the atmosphere.

Hydropattern — Refers to depth as well as hydroperiod is hydropattern. Hydropatterns are best understood by a graphic depiction of water level (above as well as below the ground) through annual cycles.

Hydroperiod — For non-tidal wetlands, the average annual duration of flooding is called the hydroperiod, which is based only on the presence of surface water and not its depth.

I

Impoundment — An above ground reservoir used to store water.

Independent Technical Review Team — A group autonomous of the Project Team established to conduct reviews to ensure that design products are consistent with established criteria, guidance, procedures and policies.

Indicator Species — Organism, species, or community which indicates presence of certain environmental conditions.

Invertebrate — A small animal that does not have a backbone, examples include crayfish, insects and mollusks, which can be indicators of ecosystem status.

J

K

L

Lag — The amount of time after one task is started or completed before the next task can be started or completed.

Land Classification — An economic classification of variations in land reflecting its ability to sustain long-term agricultural production.

Levee — A human-created embankment that controls or confines water.

Littoral Zone — The shore of land surrounding a water body that is characterized by periodic inundation or partial saturation by water level. Typically defined by species of vegetation found.

Local Sponsor — The South Florida Water Management District.

M

Macrophytes — Visible plants found in aquatic environments, including sawgrass, sedges and lilies.

Marl — Soils comprised of clays, carbonates, and shell remains.

Marsh — An area of low-lying wetland.

Master Program Management Plan (MPMP) — A document which describes the framework and processes to be used by the USACE and the SFWMD for managing and monitoring implementation of the Comprehensive Everglades Restoration Plan.

Mercury — Heavy metal that is toxic to most organisms when concerted into a byproduct of inorganic-organic reaction. Distributed into the environment mostly as residual particles from industrial processes.

Mitigation — To make less severe; to alleviate, diminish or lessen; one or all of the following may comprise mitigation: (1) avoiding an impact altogether by not taking a certain action or parts of an action; (2) minimizing impacts by limiting the degree or magnitude of an action and its implementation; (3) rectifying an impact by repairing, rehabilitating or restoring the affected environment; (4) reducing or eliminating an impact over time by preservation and maintenance operations during the life of an action; and (5) compensating for an impact by replacing or providing substitute resources or environments.

Model — A tool used to mathematically represent a process which could be based upon empirical or mathematical functions. Models can be computer programs, spreadsheets, or statistical analyses.

Monitoring — The capture, analysis and reporting of project performance, usually as compared to plan.

Multi-purpose project — A project offering environmental benefits and other water related needs.

Muck lands — Fertile soil containing putrid vegetative matter.

N

National Economic Development (NED) — Corps of Engineers benefit evaluation process used to justify Recreation expenditures.

No Action Alternative — The planning process by which the action agency decides to not carry forth any planned action to alter existing conditions.

O

Objective — A goal expressed in specific, directly measurable terms.

Off-peak — Less than peak design flow rate during storm runoff producing events.

Operation, Maintenance, Repair, Rehabilitation, Replacement (OMRR&R) — 100% local sponsor responsibility to OMRR&R recreation facilities and amenities.

Outreach — Proactive communication and productive involvement with the public to best meet the water resource needs of south Florida.

Oxygen Demand — The biological or chemical demand of dissolved oxygen in water. Required by biological processes for respiration.

P

Peat — Soil rich in humus or organic (exerts of oxygen demand) and is highly porous.

Performance Measure — A desired result stated in quantifiable terms to allow for an assessment of how well the desired result has been achieved.

Periphyton — The biological community of microscopic plants and animals attached to surfaces in aquatic environments, for example algae.

Phosphorus (P) — Element or nutrient required for energy production in living organisms. Distributed into the environment mostly as phosphates by agricultural runoff (fertilizer) and life cycles. Frequently the limiting factor for growth of microbes and plants in south Florida.

Programmatic Regulations — Section 601(h) of WRDA 2000 states that the overarching purpose of the Comprehensive Plan is the restoration, preservation and protection of the south Florida ecosystem while providing for the other water related needs of the region, including water supply and flood protection. The purpose of the regulations is to ensure that the goals and objectives of CERP are achieved. The regulations will contain: (1) processes for the development of Project Implementation Reports, Project Cooperation Agreements and operating manuals that ensure the goals and objectives of the plan are achieved; (2) processes that ensure new scientific, technical, or other information such as that developed through adaptive management is integrated into the implementation of the plan; and (3) processes to establish interim goals to provide a means by which the restoration success of the plan may be evaluated throughout the implementation process.

Project — A sequence of tasks with a beginning and an end that uses time and resources to produce specific results. Each project has a specific, desired outcome, a deadline or target completion date and a budget that limits the amount of resources that can be used to complete the project.

Project Partnership Agreement (PPA) — A document that describes the roles and responsibilities of the USACE and SFWMD for real estate acquisition, construction, construction management and operations and maintenance.

Project Delivery Team — An interdisciplinary group formed from the resources of the implementing agencies, which develops the products necessary to deliver the project.

Project Duration — The time it takes to complete an entire project from starting the first task to finishing the last task.

Project Implementation Report (PIR) — A decision document that will bridge the gap between the conceptual design contained in the Comprehensive Plan and the detailed design necessary to proceed to construction.

Proposed Action — Plan that a Federal agency intends to implement or undertake and which is the subject of an environmental analysis. Usually, but not always, the proposed action is the agency's preferred alternative for a project. The proposed action and all reasonable alternatives are evaluated against the no action alternative.

Public Involvement — Process of obtaining citizen input into each stage of the development of planning documents. Required as a major input into any EIS.

Public Outreach — A program-level activity with the objectives of keeping the public informed of the status of the overall program and key issues associated with restoration implementation and providing effective mechanisms for public participation in the restoration plan development.

Pump Station — A human constructed structure that uses pumps to transfer water from one location to another.

Q

Quality Assurance (QA) — The process of evaluating overall project performance on a regular basis to provide confidence that the project will satisfy the relevant quality standards.

Quality Control (QC) — The process of monitoring specific project results to determine if they comply with relevant quality standards, and identifying means of eliminating causes of unsatisfactory performance.

R

Recharge — The processes of water filling the voids in an aquifer, which causes the piezometric head or water table to rise in elevation.

Record of Decision — Concise, public, legal document which identifies and publicly and officially discloses the responsible official's decision on the alternative selected for implementation. It is prepared following completion of an Environmental Impact Statement.

Regional Water Supply Plan — Detailed water supply plan developed by the District under Ch. 373.0361, F.S.

Reservoir — Artificially impounded body of water.

> **Reservoir Storage Capacity** — Reservoir capacity normally usable for storage and regulation of reservoir inflows to meet established reservoir operating requirements.
>
> **Flood Control Storage Capacity** — Reservoir capacity reserved for the purpose of regulating flood inflows to reduce flood damage downstream.

Restoration — The recovery of a natural system's vitality and biological and hydrological integrity to the extent that the health and ecological functions are self-sustaining over time.

Restoration Coordination and Verification (RECOVER) — A program-level activity whose role is to organize and apply scientific and technical information in ways that are most effective in supporting the objectives of the Comprehensive Everglades Restoration Plan.

Restudy — The Central and South Florida Project Comprehensive Review Study, authorized by the Water Resources Development Act of 1992, which examined the Central and Southern Project to determine the feasibility of modifying the project to restore the south Florida ecosystem and provide for other water-related needs of the region, and which resulted in The Final Integrated Feasibility Report and Programmatic Environmental Impact Statement, which was transmitted to Congress on July 1, 1999.

Risk Analysis — An evaluation of the feasibility or probability that the outcome of a project or policy will be the desired one; usually conducted to compare alternative scenarios, action plans or policies.

S

Scoping — The process of defining the scope of a study, primarily with respect to the issues, geographic area, and alternatives to be considered. The term is typically used in association with environmental documents prepared under the National Environmental Policy Act.

Scrub — A community dominated by pinewoods with a thick understory of oaks and saw palmetto, and which occupies well-drained, nutrient-poor sandy soils.

Seepage — Water that escapes control through levees, canals or other holding or conveyance systems.

Sheet Flow — Water movement as a broad front with shallow, uniform depth.

Slough — A depression associated with swamps and marshlands as part of a bayou, inlet or backwater; contains areas of slightly deeper water and a slow current; can be thought of as the broad, shallow rivers of the Everglades.

South Florida Ecosystem — An area consisting of the lands and waters within the boundary of the South Florida Water Management District, including the Everglades, the Florida Keys and the contiguous near-shore coastal waters of South Florida.

Spatial Extent — Area that is continuous without non-integrating internal barriers or land usage.

Spillway — Overflow structure of a dam.

Stakeholders — People or organizations having a personal or enterprise interest in the results of a project, who may or may not be involved in completing the actual work on that project.

Stormwater — Surface water resulting from rainfall that does not percolate into the ground or evaporate.

Stormwater Treatment Area – Constructed freshwater wetland which utilize emergent and/or submergent aquatic vegetation in the removal of nutrients from stormwater.

Subsidence — A local mass movement that principally involves the gradual downward settling or sinking of the earth's surface with little or no horizontal motion. It may be due to natural geologic processes or mass activity such as removal of subsurface solids, liquids, or gases, ground water extraction, and wetting of some types of moisture-deficient loose or porous deposits.

Surficial Aquifer — An aquifer that is closest to the surface and is unconfined; the water level of a surficial aquifer is typically associated with the groundwater table of an area.

Sustainability — The state of having met the needs of the present without endangering the ability of future generations to be able to meet their own needs.

Swamp — A generally wet, wooded area where standing water occurs for at least part of the year.

T

Threatened species — Legal status afforded to plant or animal species that are likely to become endangered within the foreseeable future throughout all or a significant portion of their range, as determined by the U.S. Fish and Wildlife Service or the National Marine Fisheries Service.

Tiering — Procedure which allows an agency to avoid duplication of paperwork through incorporation by reference of the general discussions and relevant specific discussions from an environmental impact statement (EIS) of broader scope into a subsequent EIS of narrower scope.

Trade-Off — Allowing one aspect of a project to change, usually for the worse, in return for another aspect of the project getting better.

Tributary — A stream feeding into a larger stream, canal or waterbody.

U

V

W

Water Budget — An account of all water inflows, outflows, and change in storage for a pre-specified period of time.

Water Conservation Areas (WCAs) — Marshland areas that were designed for use as storage to prevent flooding, to irrigate agriculture and recharge well fields and as input for agricultural and urban runoff; the Water Conservation Areas WCA-1, WCA-2A, WCA-2B, WCA-3A, and WCA-3B comprise five surface water management basins in the Everglades; bounded by the Everglades Agricultural Area on the north and the Everglades National Park basin on the south, the WCAs are confined by levees and water control structures that regulate the inflows and outflows to each one of them.

Watershed — A region or area bounded peripherally by a water parting and draining ultimately to a particular watercourse or body of water.

Wetlands — Areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction.

Wet Season — Hydrologically, for south Florida, the months associated with a higher than average incident of rainfall, June through October.

Wildlife Corridor — A relatively wide pathway used by animals to transverse from one habitat arena to another.

Wildlife Habitat — An area that provides a water supply and vegetative habitat for wildlife.

X

Y

Z

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